May 1942

TECHNOLOGY REVIEW

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BACKBONE FOR STEEL!

Chromium, the element that imparts precious color to rubies, imparts something more precious to steel. It gives steel incredible hardness and resistance to heat and corrosion. It makes steel strong, yet ductile and shock-resistant.

Chromium is the key that has opened — and is still opening — great new fields of application for steel. Without chromium, the whole wonderful series of *stainless steels* would not have been possible. From tarnish-free tableware to corrosion-resistant chemical equipment . . . from strong, lightweight truck bodies to streamlined trains and airplanes . . . from heat-defiant boiler tubes to high-temperature steam turbines . . . chromium has made possible a *steel* with properties of the *noble metals.*

But the stainless steels are only one great contribution of chromium. This element has also helped to provide hard, shock-resistant armor plate and armor-piercing projectiles; long-wearing engine valves; strong, tough gears, tools, ball bearings, car trucks, shafts, springs, and dies; and hundreds of other improved articles.

We do not make steel of any kind. But for over 35 years, we have made ferro-alloys and alloying metals used in steel-making. Among these are chromium, silicon, manganese, vanadium, tungsten, zirconium, columbium, and calcium.

It was our research and development that made the low-carbon grades of ferro-chromium available commercially. Without these, production of a majority of the stainless steels would have been impracticable. Inquiries about stainless and other alloy steels — their manufacture, fabrication, and use — are cordially invited.

The progress made by Electro Metallurgical Company in the manufacture and use of ferro-alloys and in the development of alloy steels has been greatly facilitated by metallurgical research in the laboratories of Electro Metallurgical Company and Union Carbide Company; by the advances in electric furnace electrodes and techniques of National Carbon Company, Inc.; and by the broad experience in the production, fabrication, and treatment of metals of Haynes Stellite Company and The Linde Air Products Company. All of these companies are Units of Union Carbide and Carbon Corporation.

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SOUTHBRIDGE MASSACHUSETTS

THE TECHNOLOGY REVIEW, May, 1942. Vol. XLIV, No. 7. Published monthly from November to July inclusive at 10 Ferry Street, Concord, N. H. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription $3.50; Canadian and Foreign subscription $4.00. Entered as second-class matter at the Post Office at Concord, N. H., under the Act of March 3, 1879.

THE TABULAR VIEW

Bounce. — Various activities having to do with the surface of the sea have in the past been reported for The Review by RICHARD HALLET, who in this issue writes with compelling zest of matters far beneath that gleaming plane. His description (page 311) of the methods employed by oceanographers for determining depth and the condition of the unseen bottom summarizes another way in which science has advanced over the rough-and-ready techniques of an older day.

Balm. — Beauty to delight the eye and strength to reassure the mind are best secured from wood when it has been cut into veneers and bonded to form plywood for the construction of household furnishings, playthings, and a myriad other peaceful devices. So reasons THOMAS D. PERRY, '00, who in this Review (page 313) continues in the nonmilitary field his survey of modern applications of the material, which he began in our issue for December. Mr. Perry is sales and development engineer for the Resinous Products and Chemical Company.

Boom. — Drawing further on the Gaffield collection in the Institute Library, STERLING LANIER recounts for The Review (page 316) the heyday of Massachusetts' Nineteenth Century ventures in glassmaking. The middle portion of that century saw a boom atmosphere in the industry, a cross section of which fills many pages in the unique records available at Technology. Mr. Lanier, an instructor in English at the Institute, has sifted from the material an informative discussion of a little-known portion of industrial history.

Base. — Staff member by turns of both *The Tech* and the *Tech Engineering News*, MILTON B. DOBRIN, '36, as an undergraduate at Technology was an able journalist, a rating which he has augmented in years since. A geophysicist with the Gulf Research and Development Company, he discusses in this Review (page 319) methods by which geophysical detectives have been progressing toward comprehension of the hidden materials on which is based the superficial earth that is the limit of most men's knowledge. As it has at present developed, the inquiry which Mr. Dobrin ably depicts is an excellent example of pure research done for the advancement of knowledge.

Boat. — From BERTRAND R. T. COLLINS, '88, comes an interesting reminiscent account (page 325) of how Technology men traveled to the first Chicago world's fair, now nearly half a century ago. Mr. Collins, who is secretary of his Class, was the moving spirit in the chartering of a steamer for the trip which he describes.

Brute. — It would take quite a Don Quixote to tilt at what is probably the world's biggest windmill, pictured on our cover. This is the Smith-Putnam wind turbine for the generation of electricity. The Review for December, 1940, recounted the participation of Technology men in the design and construction of the device on Grandpa's Knob in Vermont.

The Country Club's new tractor is protecting the Panama Canal

If the fairways of the Country Club are a little rough in spots, members can add a stroke or two and blame it on the Japs. For the materials to produce the new tractor that was going to pull the club's gang of lawn mowers are now in a tractor somewhere in Panama, hauling a heavy gun. Either there or on our farm lands, helping a farmer grow bigger crops. Between them, Private Brown and Farmer Brown get all the new tractors there are.

In this war of blitz and counter-blitz, big guns must have the mobility of tanks. That means a tractor for every heavy gun. Add to these the thousands of tractors our farmers must have, and it is easy to see why the tractor manufacturers must strain every resource to fill the need.

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REVERE COPPER AND BRASS INCORPORATED

EXECUTIVE OFFICES: 230 PARK AVENUE, NEW YORK

MAIL RETURNS

Question

FROM HAROLD K. FARR, '35:

The March issue of The Review contains on page 225 a picture captioned, "Lifting the slips out of the hole in the rotary table. Both pipe wrenches are on the drill-pipe couplings, ready to break out the joint." I should say that the slips were being lowered into place in the rotary table. If the drill pipe were uncoupled without the slips in place, it would fall to the bottom of the hole.

Cambridge, Mass.

Answer

FROM GILBERT W. NOBLE, '25:

Mr. Farr is correct as to the caption of the photograph used on page 225 in my article, "Wells of Power." I noticed this error when I first saw the article in print, but hoped that too many of the eagle-eyed readers would not catch it. The entire set of the drill pipe must at all times be supported, either by the elevators suspended from the hook or by the slips set in the rotary table. In the left-hand illustration on page 225, the caption is correct. The elevators are being latched below the coupling on the drill pipe. The weight of the stand of drill pipe was being entirely supported by the pipe slips at the time the picture was taken.

As soon as the elevators are raised by the hoist, the slips will disengage themselves and start to come out of the hole in the rotary table. The roughnecks catch them by the handles and set them back out of the way. You will notice that both sets of tongs have swung back out of the way of the pipe in the left-hand illustration. As the third coupling is raised above the rotary table, both sets of tongs are latched onto the couplings, one above and one below the threaded connection of the tool joint. Then after the roughnecks pick up the slips and set them into the hole in the rotary table, the driller disengages the hoist, holds the cable with the brake, and (by releasing the brake) slowly lowers the string of pipe until the slips take hold of it. At this stage, the entire weight of the drill pipe, including the three joints above the slips, is suspended from the rotary table.

Of course, the operation of lowering the slips to transfer the weight of the pipe to the rotary table and the operation of lifting the slips as the pipe is being raised will appear to the camera exactly the same, but having both sets of tongs on the pipe proves that the slips are being lowered preparatory to breaking out the joint.

Rolla, Mo.

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MOLY

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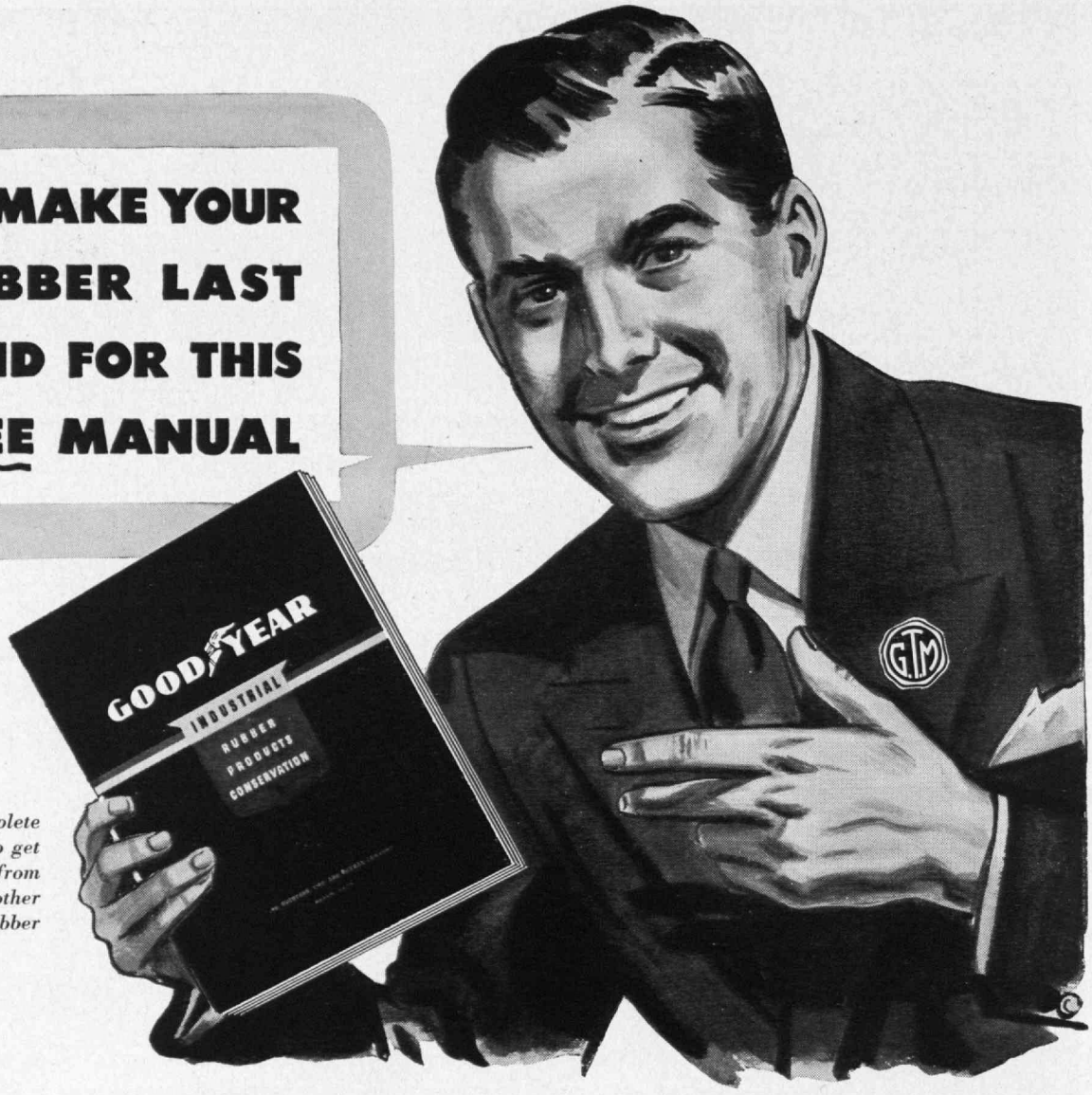

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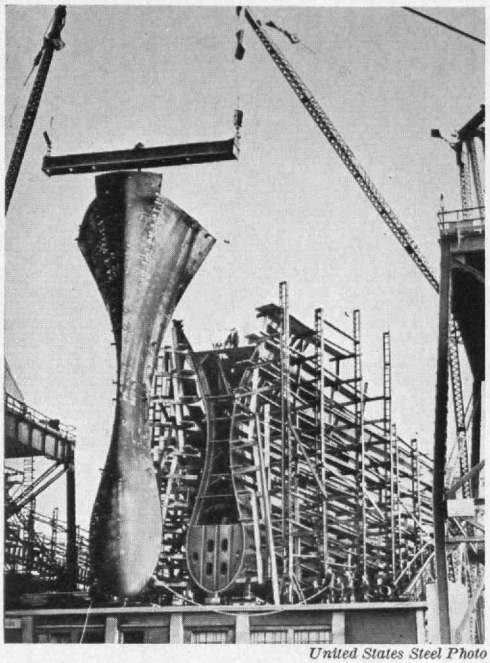

United States Steel Photo

The welded bow section of a tanker is swung into place on a shipway. Shop assembly of large hull units speeds emergency ship production.

VOLUME 44 NUMBER 7

THE TECHNOLOGY REVIEW

TITLE REGISTERED U. S. PATENT OFFICE

EDITED

AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CONTENTS for MAY, 1942

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Published monthly from November to July inclusive on the twenty-seventh of the month preceding the date of issue, at 50 cents a copy. Annual subscription, $3.50; Canadian and foreign subscription, $4.00. Published for the Alumni Association of the M.I.T.: B. Edwin Hutchinson, President; John E. Burchard, Harold Bugbee, Vice-Presidents; Charles E Locke, Secretary; Ralph T. Jope, Treasurer. Published at the Rumford Press, 10 Ferry Street, Concord, N. H. Editorial Office, Room 3–219, Massachusetts Institute of Technology, Cambridge, Mass. Entered as second-class mail matter at the post office at Concord, N. H. Copyright, 1942, by the Alumni Association of the Massachusetts Institute of Technology. Three weeks must be allowed to effect changes of address, for which both old and new addresses should be given.

Leppert from Black Star

TEMPLE

. . . of Corinthian design in the formal Greek garden on the estate of the late Samuel Untermyer

THE
TECHNOLOGY
REVIEW

Vol. 44, No. 7

May, 1942

The Trend of Affairs

Better Breaks

WHEN, long ago, Omar the Tentmaker wrote a melodious verse inquiring, could we grasp this sorry scheme of things entire,

> Would not we shatter it to bits — and then
> Re-mold it nearer to the Heart's desire!

he neatly summarized a complaint of orderly man against disorderly nature, and he put into a single phrase a procedure fundamental to many, if not most, of the industrial operations on which our civilization is based. For Nature is a pretty disorderly individual, who mixes and mingles materials in almost inextricable higgledy-piggledy fashion, so that, if he is to use those materials, man must first spend much time and treasure in disentangling them from each other and in getting them into orderly isolation. This business of shattering it to bits has to be done before any kind of remolding can occur, and shattering it to bits is a costly process. Half the problems which industry encounters in the handling of solids are involved in the process of detaching a desired substance from the undesired materials with which nature has mixed it. In some operations, this cost of severance may reach 50 to 75 per cent of total cost.

For these reasons, far-reaching increases in economy and efficiency may be expected to follow on any improvement in the comminution of materials, particularly of ores. Comminution, the making of little ones out of big ones, is technology's name for "shattering it to bits." Of the factors making up the cost of comminution — labor, power, supplies — power is the principal one on a per-ton basis. One-sixth to one-fourth of the total cost of severance may go into power used up in comminuting materials prior to the separation of ore from gangue. At first thought, a measure of the efficiency of the crushing operation is easily to be had through measuring output (the amount of surface produced through the process) against input (the foot-pounds of energy applied). But when thus measured, the process is found to have an efficiency of the order of 1/10 of 1 per cent. This efficiency is so consistently low that a very natural question is whether some low limiting factor does not rule.

Such a gloomy conclusion, however, may not necessarily hold, for though such measurements have been made to the best of present ability, the formula for measurement is not very efficient itself. In the first place, to determine the actual energy input by accepted methods is a baffling task. In the second place, to ascertain the total surfaces of the powders produced by comminution is an intricate problem. In the third place, to relate energy to the unit surface of broken, jagged, and irregular material is a complicated question.

Because of the number and complexity of the unknowns in this problem, a program of investigation now getting under way in the Richards Mineral Dressing Laboratories of the Department of Metallurgy at Technology is expected to extend over a number of years. Under the direction of Antoine M. Gaudin, Richards Professor of Mineral Dressing, a number of different methods of working toward the desired answers have been commenced.

For surface measurement of powders produced in comminution, apparatus based on that designed by Paul H. Emmett, professor of chemistry and gas engineering at Johns Hopkins University, is under construction. Its purpose is to measure the amount of a gas that can be adsorbed on the surface of a sample of material and thus to provide means for determining the total area of that surface. To ascertain the work expended in comminution, the Technology researchers are improving on the conventional drop-weight machine. Utilizing two pendulums which are released from a

known height to strike a sample of material simultaneously and then to rebound for a distance which can be measured, their device is expected to simplify the task of determining the amount of energy which the pendulums use up in crushing the sample. A problem here is that of collecting the comminuted material. One possible method consists in enclosing the sample in a collodion sack which itself does not absorb an appreciable amount of the energy of the pendulums but which prevents loss of comminuted material. An alternative scheme under consideration is that of operating the device within a moderate vacuum.

Study of the mechanics of fracturing is another aspect of the program. Here, working with Reinhardt Schuhmann, Jr., '38, Assistant Professor of Mineral Dressing, Eugene Poncelet — recently professor of mineral dressing at Laval University in Quebec, who is at present a guest of the Institute as a fellow of the Belgian American Educational Foundation — has reached some interesting findings in fracture tests on glass samples.

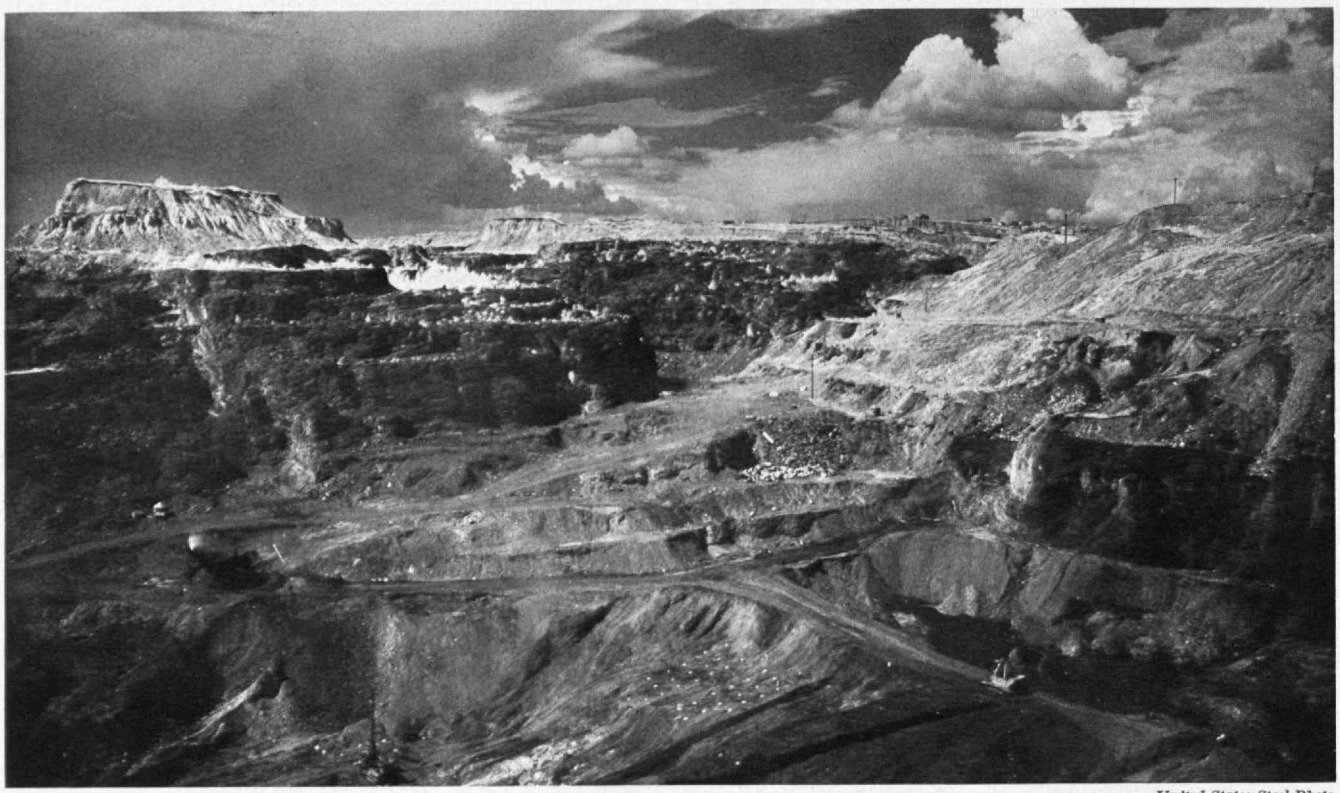
Standing a small square of quarter-inch glass on edge and subjecting it to a vertical load, Professor Poncelet has found that glass will not break under increasing load to a value as high as 7.3 tons but that as the load is released a piece of glass which has been compressed to such a high figure without any trouble suddenly cracks when the decreasing load reaches a value of three tons or less. In a number of samples of uniform dimension, the initial cracks parallel the vertical edges in virtually uniform positions. Whether glass is by nature neurotic and begins to break down only after the crisis has passed seems to be a fair question implied by this finding. As the results of Professor Poncelet's work may lay the basis for an explicit theory of fracture, it is foreseen that they will contribute to the whole comminution program. Comparison of the behavior of materials of different crystal structures in order to correlate efficiency in crushing with the type of crystal structure is another part of the program now in contemplation. For further investigation of the work expended in crushing, a device to study the process from a thermal point of view is under consideration. This would make possible measurement of the heat evolved in grinding and consequently would provide a measure of the energy wasted.

A program such as this is necessarily lengthy. Since comminution is of such fundamental importance to our use of metals and of other minerals, progress of the studies in the Richards Mineral Dressing Laboratories is expected to be of extreme interest to a considerable number of industries.

Trotlines for Vitamins

FLORIDA trotlines are sharing in the task of substituting for Norwegian nets as a source of the fish oils essential in American diets. As imports of cod-liver oil have steadily been diminished by war — falling from 6,000,000 gallons in 1939 to about 1,000,000 in the first nine months of 1941 — shark fishing has boomed on both coasts of this continent. From shark livers, oil is available possessing a ratio of about 60 United States Pharmacopeia units of vitamin A to 1 U.S.P. unit of vitamin D, as against a ratio of 10 to 1 for cod-liver oil. Some 22,000 gallons of shark-liver oil were produced by the Florida fisheries last year.

Trotlines of steel chain, set at intervals with baited hooks and anchored at each end to buoys in water about 100 feet deep some nine miles offshore, are used in the



United States Steel Photo

The Spruce mine of the Oliver Iron Mining Company at Eveleth, Minn., deep into the earth under high-piled clouds

fisheries. Each line is from 3,000 to 4,000 feet long. Nine species of sharks are found in Florida waters in sufficient numbers to be of commercial value. The smallest of these, the nurse shark, seldom over nine feet in length, may be taken in nets. For the others, the trotline is preferred.

The Florida shark fishery is of considerable age. In past years, however, the fins and hides were the fisherman's prizes, so that current demand for shark-liver oil represents an added premium. The fins, dried on racks for three or four weeks, are shipped for sale in Chinese centers, where shark-fin soup, made from a gelatin extracted from the fin, is highly desired. The hide is made into a very durable leather. The meat of the shark is high in protein content and therefore makes an excellent fish meal. It is eaten as a food in a few regions.

Tagged and Labeled

FOR sheer virtuosity, not to mention magnitude, few feats in the recent history of measurements rival the investigations which, mainly over the past 25 years, have revealed the nature and characteristics of lightning. Of the more common phenomena of nature, none has defied the scientist more successfully; it is dangerous to deal with, unpredictable, and literally "over in a flash." Benjamin Franklin, displaying more luck than discretion, sniffed at the problem in 1752, establishing the electrical nature of lightning and making what was probably the first sound nonpoetical observation on the subject. Until about 1900, when free ions were discovered in the atmosphere, little more knowledge of importance was added. But the growth of electrical power, with its giant and costly transmission systems, compelled engineers to turn their attention to lightning research, for lightning soon became the major cause of breakdowns in these lines. Under average storm conditions in this country, a power line may expect to be hit about once a year for every mile of length. Higher structures may be struck far more often: A 565-foot smokestack of the Anaconda Copper Mining Company has been struck five times in two years; the Empire State Building in New York, with its tip 1,250 feet above the street level, has been struck 68 times in three years.

Stimulated by the economic importance and technical difficulty of the problem, public utilities and the electrical manufacturing industry have co-operated in extensive field studies and in the development of wholly new instruments. Laboratory apparatus large enough to test full-scale equipment with conditions at least approximating those present in a lightning flash has been built. By 1929, apparatus creating electrical discharges of 5,000,000 volts was available, and by 1933 currents up to 140,000 amperes — as heavy as those ordinarily found in nature — were being produced in the laboratory. As a result of such studies, safeguards against lightning have been developed to the point where one well-protected power line in California suffered only two interruptions in eight months as the result of lightning, whereas an unprotected line in similar territory had 38 breakdowns.

Profound as has been the public's respect for lightning, it has, if anything, underestimated the remarkable properties of this phenomenon. To the ancients, lightning was the weapon of the primary gods; to the moderns, as a magnificent passage from Jules Romains' *Men of Good Will* may illustrate, it remains a symbol of dread and inevitability. Describing the ominous

F. S. Lincoln, '22

United States Navy P-T patrol boats plow through the water before the lofty buildings of New York

Zoltan Glass from Black Star

Bacchanal for a springtime of war — a British soldier demonstrating camouflage technique at a Home Guard school

dawning of the Twentieth Century, he wrote: ". . . War had started roaming around Europe . . . the Spanish-American war, the Transvaal war, the Russo-Japanese war. Every time the lightning flashed more vividly; the thunder rolled more loudly. . . ."

His metaphor is conservative. Lightning flashes over this planet continuously, striking the earth on the average of 50 times a second, perhaps two billion times a year. During the peak of the complicated series of strokes which constitute a lightning flash, power may flow between earth and sky at the rate of well over a billion horsepower. Through an ionized path believed to be less than one inch in diameter, currents up to and possibly exceeding 200,000 amperes may be reached momentarily. These high rates arise, of course, from the exceedingly short times during which the heaviest currents of a lightning flash flow. Actually, the average amount of electricity in an entire flash — about 30 coulombs — is far less than the amount which can be charged into a storage battery.

While the base of a thunderstorm cloud may occasionally drop to as little as 500 feet above the ground, such clouds have also been observed to altitudes of 20,000 and 30,000 feet. The manner in which intense electrical fields accumulate within clouds, where they can remain practically immobile, is not completely understood. When the potential between ground and cloud becomes sufficiently great, however (following the description by C. F. Wagner and G. D. McCann), a "pilot streamer" starts out from the cloud. Wandering through virtually nonionized and therefore high-resistance air, this streamer is of such low current-density that its existence has been deduced rather than observed. The pilot travels rather "slowly," its speed being only 1/20 of 1 per cent that of light, but with it comes a faster, heavier current, called the "stepped leader" because of its tortuous path. Its velocity is about 1/6 that of light.

On the instant that the stepped leader strikes the ground, a heavy current leaps toward the cloud, with a speed of about 1/10 that of light. This is the heart of a lightning flash — the current rising within microseconds to values of from 1,000 to 200,000 amperes. This is the stroke which sets the thunder rolling, which blasts oak trees and puts power lines out of commission. The foregoing account holds only for strokes to relatively low structures. As investigations conducted on the Empire State Building since 1935 show, lightning that strikes high buildings, smokestacks, and so on, tends to start with a leader moving upward to the cloud; since such current builds up much more slowly than does that of the usual stroke, strokes which hit high objects sometimes result in no thunder. The cycle is not necessarily ended with the passage of the heavy current from earth to cloud, for as the area in the cloud from which the stroke originated is neutralized, electrical potentials are set up which may make charges from other parts of the cloud move to this original area. This time a conducting path to the ground is already formed, and the leader moving down from the cloud travels relatively fast — about 3 per cent as fast as light — and is called a "dart leader." Again, as it strikes the ground, a heavy current leaps toward the cloud, and the process may be repeated many times.

Confirmation

FROM year to year, The Review has reported the progress of a vigorous and unremitting battle waged by science in the interest of millions of people, many of whom will in all probability live out their lives as unwitting beneficiaries of the action. This battle is that which scientists of the Rockefeller Foundation have carried on against mosquitoes — specifically against the scourges of malaria and of yellow fever which mosquitoes carry to the destruction of man. Notable in the foundation's report of a year ago was the prediction that *Anopheles gambiae*, an extremely efficient carrier of malaria, would no longer menace Brazil, where more than 2,000 workers and more than $2,000,000 had been

employed in fighting the insect after the inadvertent importation of it from Africa. This year, with no fanfare, the foundation reports the confirmation of that prediction. In an area exceeding that of the original infestation, not a single gambiae was found last year. This battle seemingly has been won.

Nor is this all. Taking to the treetops in South American jungles, investigators found that a reservoir of Haemagogus mosquitoes — carriers of jungle yellow fever — lives from one rainy season to the next in the roof of the forest. Thus the researchers demonstrated an adequate mechanism for the carry-over of yellow fever through the dry season, when Haemagogus disappears at ground level. The continuing existence of such pools of jungle yellow fever is a constant threat, for from them might come the reinfection of areas infested by *Aëdes aegypti*, the carrier mosquito against which the foundation has directed full-scale efforts in years past. How effective those efforts have been may be judged from the fact that for the fourth year in a row, no aegypti-transmitted yellow fever, either urban or rural, was recorded anywhere on the American continents. Similar progress toward solution of the mystery of jungle yellow fever can be recorded for central Africa. There the foundation's scientists, working in regions where the aegypti mosquito is scarce, isolated the virus from two wild-caught lots of a prevalent mosquito, *Aëdes simpsoni*.

Such advances are heartening in their testimony to the perseverance of science. They are of added importance in the present because the special dangers in disease which are imposed by war make every freeing of skilled medical researchers doubly valuable. Malaria becomes a greater peril when armies must move in such regions as Trinidad and Burma. Typhus, one of the deadliest concomitants of war throughout human history, bids fair not to spare the world in this war. The foundation's scientists, mobilized against these foes long since, are pressing study and investigation to increase knowledge of them.

Thin

ALMOST 80 per cent of cargoes carried to Europe by planes of the Italian Lati air line in the first half of 1941 consisted of an anhydrous silicate of aluminum and potassium, unique among natural products because of the fineness of the cleavage layers into which it may be divided. Commercially, this substance — mica — is of special worth because it possesses high electrical insulating qualities and ability to withstand high temperatures. It is essential in the manufacture of radios, high-compression airplane motors, electric locomotives, and many appliances. Though the Western Hemisphere has rich deposits of this material — it was potash mica from Brazil and Argentina which went eastward in the Italian planes — the Eastern world has been the greatest producer of it. Of the total world production of about 9,016 tons in 1938, 6,334 came from India; 747 from Madagascar; and the rest from the United States, Canada, Argentina, and Brazil.

India's leadership in the production of mica is testimony to the value of the skilled hand even in an age of machines. The most important form in which mica is used is mica splittings — sheet mica usually less than three-quarters of a square inch in area and a thousandth of an inch in thickness — destined to be joined together into large sheets. No satisfactory machine has yet been constructed for the splitting of mica; consequently, India's enormous supply of cheap labor skilled in the delicate task has led to Indian supremacy in production. The ultimate thickness — or, rather, thinness — of the cleavage layers of mica is unknown; it is thought that the limit may be but one layer of molecular structure.

The Western Hemisphere's production of mica is almost entirely in the "sheet," or "block," classification — from three to eighty inches in area and not less than a hundredth of an inch in thickness. Since sorting and preparation constitute many of the principal problems in the production of the strategic types of mica, effort is foreseen to establish in this hemisphere a center for grading and splitting and to develop skilled workers.

Somnolence, curiosity; massiveness, celerity — contrasts in an aquarium

Paul J. Woolf

Molecular Sociology

IN the golden months of summer, a certain type of solution engages most people's attention from time to time. Let it be julep or grape juice as you will, but let there be plenty of ice in it. Courteously and gently the ice melts away, keeping the solution cool. In very cold weather, the ice would grow instead and would prevent the solution from getting too cold.

In winter, just the other way. The cooling solution which then engages chief attention is not a drink but the solution in the automobile radiator. That no ice be present in this solution is very important. Alcohol is the most efficient ice preventer, but alcohol is volatile; if it gets hot, it may be missing when most needed. Hence, the more stable glycol, usually under some alias, is most often used.

These two examples involve the social behavior of molecules. Though precise determination of how molecules behave in solutions such as these is not important, a very precise knowledge of molecular sociology has in other situations both practical and theoretical value. Ever since the establishment, in 1903, of the Research Laboratory of Physical Chemistry at Technology by Arthur A. Noyes, '86, Professor of Theoretical Chemistry, study of molecular sociology has been a center of attention at the Institute and now is being pursued particularly by George Scatchard, Professor of Physical Chemistry, and his students. The delicacy of measurement involved in the study may be gauged by the fact that in one phase a new apparatus determines freezing-point depressions to 2/100,000 degree. This achievement corresponds to the measurement of the vapor pressure of water to one part in 5,000,000.

If the ice melts in the summer drink but the solution freezes if cold enough, in between must be a temperature at which the quantity of ice neither diminishes nor increases. This temperature is called the freezing point of the solution; when it is reached, the ice and solution are said to be in equilibrium. Neither the freezing nor the melting has stopped at the freezing point, but freezing and melting are equal; so the net result is no change in the total amount of ice. A comparable equilibrium between solution and vapor is reached at the boiling point. For the understanding of solutions, knowledge of temperature, pressure, and concentrations at equilibrium is essential. This is the sort of knowledge Professor Scatchard is seeking.

The condensation of a vapor indicates gregariousness among the molecules composing it; volatility, on the other hand, suggests their longing to get away from their kind into the wide-open spaces. Alcohol molecules have more of this roving spirit than have molecules of water; molecules of the heavier glycol have almost no interest at all in the open air. Freezing, furthermore, shows a desire of molecules for the stiff and highly organized club life of the crystal. An increase in temperature increases volatility and decreases the tendency to form a solid.

Some solutions are truly democratic utopias, for the desire of each molecule to be in the solution is independent of the nature of its neighbors. The molecules in such a solution mix without heat and with no change of volume. The opposite extreme from this situation is the snobbery evinced by molecules of water and oil, which will not mix. The democratic solution, in which each molecule accepts any neighbor as though one of its own kind, is called an ideal solution by the chemist, who expresses the behavior of other solutions as the difference in behavior from that of an ideal solution.

A distilling column, such as is used for the separation of gasoline from petroleum, sorts out molecules by taking advantage of differences in their volatilities. To design an efficient still, the chemical engineer must know the relative volatilities of the components of the solution with which it is to deal. He considers himself fortunate if the solution is ideal so that the relative volatility does not depend on the composition. To study the relative merits of different columns, the chemical engineer needs a pair of substances which have nearly the same volatility and form almost ideal solutions, and he needs to know very accurately any variation from ideal relations. Professor Scatchard is at present studying such a mixture in an apparatus which measures the liquid and vapor composition to one part in 2,000 and the pressure to one part in 5,000 — the best that has ever been done with this sort of measurement.

More important than measurement of the behavior of any one solution is study of the reasons which make solutions in general behave as they do. Most of the experimental work with this apparatus, therefore, has been devoted to a detailed investigation of solutions which do not behave just as they are expected to, and of other solutions which differ in various degrees from these anomalous ones.

Even a general understanding of why molecules like to go to their solid clubs or to get away to the freedom of the gas would hardly justify the amount of time which is being spent at Technology and elsewhere on the study of solutions. From these same measurements, however, also can be learned the tendency of molecules to enter into chemical reactions. It is not true, of course, that water will behave chemically like alcohol if they both have the same vapor pressure, but it is true that at any given temperature, the chemical activity of a substance will be the same in all solutions in which the same vapor pressure is present. Accurate knowledge of this chemical activity is important, for upon chemical activities depend chemical equilibriums, and, in a more complicated way, the rates of chemical reactions.

Olla-podrida

PHOTOGRAPHY on a titanic scale has been brought to the aid of war industries in the reproduction of working drawings and plans and in the producing of templates and patterns from them. Cameras as big as two ordinary rooms are used to shoot drawings and layouts, at any scale desired, directly on metal surfaces prepared with a coating of photosensitive film. Sawed along the lines of the layout, the metal then becomes templates to speed fabrication. Jigs can be built up directly on such layouts. Shrink scales are eliminated in die-casting since the camera technique permits enlargement to just the proper amount to allow for shrinkage of the cooling metal. Accuracy (*Concluded on page 342*)

Herbert A. Stein, '41

Answer, Echo, Answer

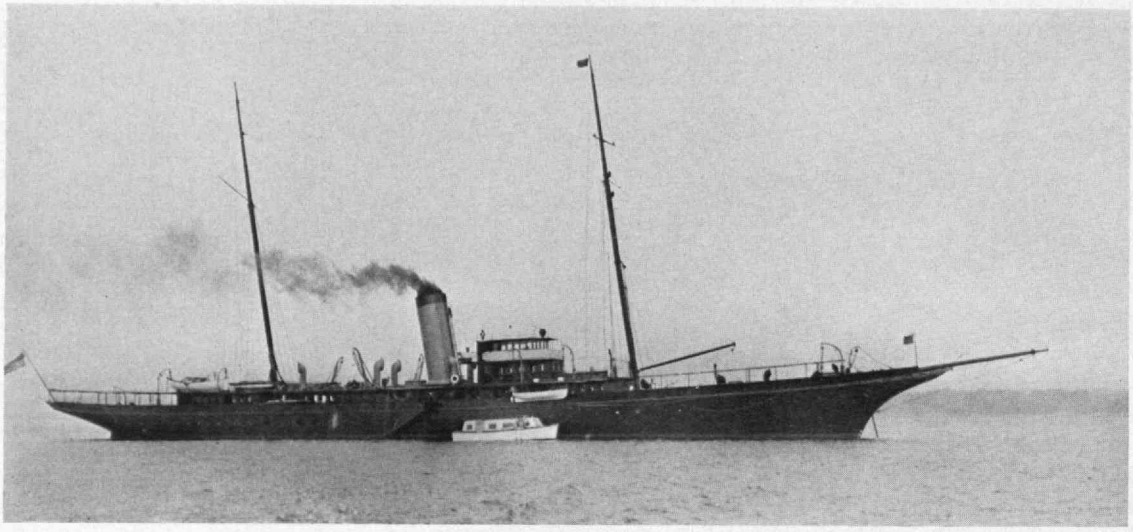
Modern Ocean Science Has Replaced the Dipsey Lead

By Richard Hallet

"WHEN the two bottoms come together, they come together blamed hard," Captain Ram of Boothbay Harbor used to say. He referred, of course, to the bottom of the ship and the bottom of the sea, and he spoke the simple truth. Through the centuries, seamanship on soundings has always depended largely on casts of the dipsey lead. The old mariners grew very canny in their knowledge of the sea's bottom, gained from lead-line casts. There's the story of the old Banks captain whose mate played a trick on him by arming the lead's tallow in advance with a pinch of dirt out of the captain's yard back home. The lead came up, the captain inspected the tallow, and then he roared: "By God, it's Noah and the flood again. We're right over my wife's cabbage garden."

Modern sounding methods have all but turned that legend into fact. I had evidence of this last summer on board the United States Coast and Geodetic Survey's ship *Oceanographer*. At the time, she was wire-dragging Casco Bay, Maine, for pinnacle rocks; but Fred L. Peacock, her captain, told me that her chief interest has been in offshore soundings.

The old-fashioned sounding vessel had to come to a dead stop to make a vertical cast of the lead, and for her position she had to rely on dead reckoning and astronomical sights, never too accurate. But the *Oceanographer*, with her modern gear, has an accurate method of continually fixing the ship's position on a sounding line. Furthermore, she can take soundings at full speed, sun or no sun, stars or no stars, fog or no fog. Captain Peacock has left San Francisco in a dense fog, surveyed a hundred miles out, been gone ten days, anchoring every other night, and has come back to a precise anchorage, without catching in all that time so much as a glimpse of anything in the way of a navigational aid.



To make echo answer, the Oceanographer *carries the finest of modern equipment.*

The *Oceanographer* can and does work twenty-four hours a day under practically any and all weather conditions. She supplies a complete profile of the bottom on any given sounding line. With her Fathometer she bounces an echo off the sea bottom and learns therefrom the depth of the water. The Fathometer creates an impulse electrically, and the elapsed time between the outgoing of that impulse and the return of the echo to the ship provides the sounding.

"Answer, echo, answer," said the poet, and now indeed echo answers. Idle echo, once merely the wonder and amusement of man, is now the busy servant of mariners and oceanographers.

Echo plumbs the very depths. Some of the new charts of the Coast and Geodetic Survey, for example, yield surprising information about the continental shelf. The shelf that runs from Newfoundland to Florida slopes gradually to its edge and then drops off abruptly into some 1,500 fathoms. Once the slope itself was thought to be fairly smooth, but modern soundings reveal a much dissected topography. Oceanographers are finding that large submarine valleys indent the continental shelf, hitherto as mysterious as the Coalsack in the Milky Way. On the new charts, the Hudson River submarine valley is plainly discernible. Other valleys appear to hook up with the Delaware and Rappahannock rivers. South of Georges Bank are valleys which may be continuations of the Kennebec and Penobscot.

What may this mean? Was the shelf uplifted so high that these rivers could carve valleys in its steep front as they torrented down to the ocean? Or are there some unknown submarine currents that could carve these valleys under the sea — perhaps mud rills of a gigantic size? Even echo cannot answer here. How all that undersea country got carved into its present shape is still a matter for speculation, but that it did get carved is beyond dispute. The shelf is deeply notched opposite the big river mouths, and some of these notches are filled in landward with debris, though the Hudson River submarine valley still shows sharp gorges and actual canyons.

Let us look first at the simpler, or inshore, method of finding the humps in the sea's floor. To examine a harbor floor like Casco Bay, Maine, the *Oceanographer*'s small boats with portable depth recorders move back and forth over a given area. The echo returns actually burn a profile of the bottom on the roll of the depth recorder. In the early days of echo sounding, the echo would not work well in less than fifteen fathoms. Then the recorder was adjusted to record eight fathoms, next to three. At the present time the *Oceanographer*'s depth recorders can sound as little as four feet. The rolls turn at the rate of two inches a minute, and an electric spark synchronized with the echo burns the paper, so that a profile of the undersea terrain appears. The character of this continuous marking on paper even reveals whether the bottom is rock or mud, and if mud, how deep the mud is.

The two questions to be answered are, "Where are you?" and "What's under you?" For a true sounding, you must know what depth is under you at the exact instant that you know where you are. Two sextant angles taken simultaneously provide a cross bearing which gives the boat's position, hooked up to shore triangulation, at the instant when the echo records the depth.

A chart of the day's work done by such a sounding boat shows a great number of parallel lines of soundings, like the furrows of a plowed field. These soundings are many more in number than the old surveys yielded; but even so, the furrows are not driven so close as to preclude the chance that a pinnacle or spire of rock may stick up between them somewhere. Thus, to develop a maximum safe depth, whether in or outside of a channel, a wire drag is used.

The drag, slung between two powerboats, has a bottom wire maintained below the surface by weights suspended from buoys by cables. This bottom wire is made up in 100-foot units with an open socket at each end, so that the units can be connected with swivels. Twelve thousand feet of this wire in open water are not excessive, but 5,000 feet are nearer the normal drag. A heavy iron weight is attached to the bottom wire at each end, with smaller weights at intervals of 300 to 600 feet.

A tender patrols the length of the drag in operation, changing its depth as the contour of the sea's bottom requires and removing fishing (*Continued on page 328*)

Except the Rod

Plywood, through Its Combination of Strength with Beauty, Finds Many Applications in the Appurtenances of Present-Day Living

By Thomas D. Perry

IT has been well said that we live our entire lives in intimate contact with objects made of wood and wood derivatives. Our earliest days are spent in a cradle of wood, and our exit from this mundane sphere will undoubtedly be in a casket of wood. Our early deportment may be controlled by a birch rod or even by a threat of the use of it. Our meals, if we are fortunate enough to have them at home, are eaten from a wooden table while we sit in a wooden chair. Most of our music comes from a piano, organ, radio, or phonograph encased in wood. Our pictures are set in wood frames. Our floors, doors, and window frames are wood. Our books, newspapers, and magazines are printed on paper made of wood pulp. Even the chip on our shoulder, if one there be, should be of wood, and from the old block. The comparison could go on ad infinitum — to the beds in which we sleep, the stairs over which we climb, the pews in which we worship, the ball bats and tennis rackets, the sleds, ski, and toboggans with which we play.

Plywood is one of the refined products of wood and occurs in nearly all of the foregoing objects, except perhaps the birch rod and the shoulder chip. An earlier article (in The Review for December) presented the story of the development of plywood as a product made from veneer, and sketched the growth of the manufacturing processes which produce it. The utilization of plywood in war industries and its substantial assistance in releasing aluminum and other essential materials were outlined in some detail. Space did not permit a description of many other plywood products which, not so distinctly martial in nature, are used for civilian activities. Among these are houses, furniture, radios, musical instruments, containers, transportation equipment, industrial equipment, and sport goods. Description of these uses may well form another chapter in the development of plywood products which express Yankee ingenuity and add to the comforts of civilization.

Plywood and its many related constructions have varied attributes that result in wide adaptability to diversified branches of human activity. Utilization of plywood is based on two main groups of desirable qualities which the material possesses: (1) high strength-to-weight ratios, which are required in aircraft, boats, and other products where light weight is an important factor; (2) beauty and comfort, which are essential factors in the manufacture of furniture, pianos, organs, radios, cabinets, doors, and the like.

Most of the uses of plywood in war projects, which were the subject of the preceding article, rely upon the first of these major virtues. In general, the strength of plywood improves as the individual layers of veneer become thinner, as the specific bonding pressures increase, and as the extent of resin impregnation becomes greater. The fundamental principles in the fabrication of those types required for strength are understood sufficiently to permit proper engineering designs. In fact, plywood's strength factors can be largely predetermined, and designs can be prepared accordingly. The recent development of resin adhesives has widened the military application of plywood, because the use of plywood is now hindered neither by exposure to extreme weather nor by underwater installation. The United States Forest Products Laboratory at Madison, Wis., is undertaking a special program, sponsored by the Army and Navy, to study the further uses of plywood in military projects. From this source additional data are expected to be made progressively available.

The beauty, warmth, and friendliness of wood have been recognized ever since household furniture came into use. The maximum beauty of wood is secured when the material is cut into thin veneers, which may be sliced or sheared in various ways for different species and growths. A crotch — where large branches join — gives a feathery, flowery effect when cut across (not into) the joint; a stump when cut on a radial line affords a velvety appearance with marked color contrasts and often reveals elusive resemblances to animal heads and odd figures; a burl when sliced across gives a more nearly uniform velvety look, with dark pockets rather evenly distributed; a pencil stripe comes from quartering; cross fire, ripple, swirl, bird's-eye, mottle, and quilted are distinct types of figures obtainable from wood cut in various ingenious ways.

An excellent example of the use of crotch veneer, center matched and symmetrically balanced, is shown in Fig. 1. It is a characteristic of all of these richly figured veneers that much of the cutting is across the fiber or at a sharp angle thereto. Consequently they are exceedingly fragile and need the reinforcing effect which results when sturdy, plain veneers are assembled with suitable adhesives into plywood. Also is it true that most of these figured veneers are raggedy and distinctly unattractive in their original cuttings. Experienced artisans know how to trim, match, and arrange these unpromising veneers in such fashion as to produce very pleasing effects, which will appeal to the highest artistic sense and give enduring pleasure to the user. The fact that adjacent sheets of thin veneer have almost identical figures permits the balanced matching and symmetrical

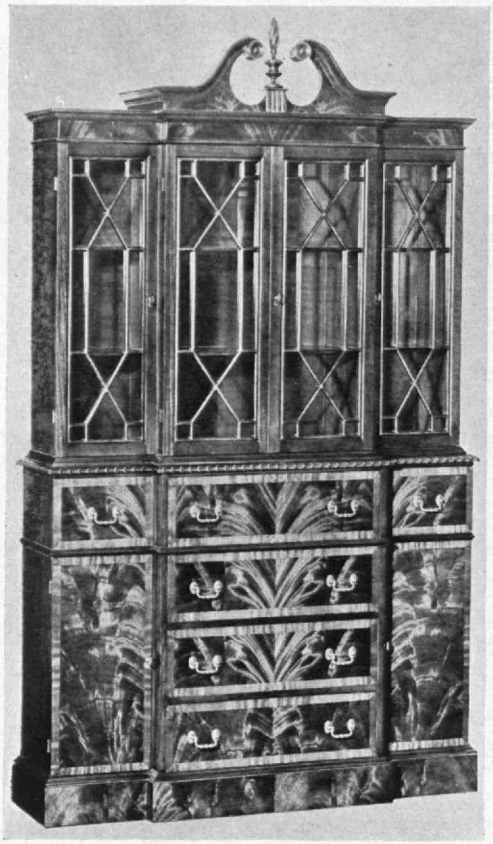


Fig. 1. Mahogany crotch veneer. Note the feathery effect of the veneer, trimmed and matched on a central line and reinforced with a plywood backing.

Northwestern Desk Company

combinations which exhibit the latent beauty of the wood. In solid wood, the knots, crotches, and surrounding cross-grained areas are usually relegated to low-grade uses; in veneer, such parts are highly prized. In solid lumber, boards cut from such locations would warp and check beyond all reason; in veneer, they can be mounted attractively on a sturdy plywood backing and can be preserved for many years of satisfying use.

Many applications of plywood combine the qualities of strength and beauty, as in the rim of a grand piano, which must be graceful and attractive, as well as sturdy enough and strong enough to carry the plate, soundboard, keys, action, and wires of the instrument. Other uses of plywood, however, emphasize neither strength nor beauty, as in the plywood shook or the dust bottom in a cabinet, the function of which is that of a protective closure having light weight and dimensional stability.

When the dominant strength must be in one direction only, many uses are found for laminated wood, which has all layers parallel, in contrast to plywood with its cross layers. Laminated wood is stronger than solid wood of the same dimensions because of the better distribution of the layers and their interbracing effect with adhesives. While it differs from plywood as indicated, it is usually made of veneer and is considered a variant in plywood constructions which meets some conditions better than does the normal product.

Another great advantage of plywood is its availability in large dimensions — a fact which has led many to call it "sheeted lumber." Customary dimensions of plywood are a sharp contrast to the relatively long narrow boards, or planks, characteristic of solid lumber. The use of these narrow units involves much handling, results in many joints, and requires the employment of a multitude of nails or other fastening devices.

Several advantages of plywood that make it particularly useful in home building are its large area, strength, light weight, flexibility, and nonsplitting qualities. The labor of delivery, cutting, handling, nailing, and so on, is considerably less for plywood than for lumber. Large sheets when properly nailed give far stronger bracing effects than do narrow boards. Another factor of importance to the use of plywood in building is that it permits so-called "dry-built" construction, where plywood instead of wet plastering is used for interiors. Plywood interiors will cost less, save time, and avoid the severe exposure to moisture that plastering inevitably involves. Thin plywood can be utilized for curved soffits of stairways or for rounded modernistic corners. In suitable grades, plywood can be used for subfloors, for interior and exterior wall sheathing, for ceilings, for roof boarding — and even for concrete forms, after which it can be used again, for roof boarding or subfloors.

Prefabricated housing is much in the limelight; yet its future, while promising, is rather elusive. It has been hailed as the logical answer to our accumulating housing shortage. At first thought, prefabrication seems the ideal solution of most major housing problems, at least in the low-cost ranges. On second thought, there appear to be some difficulties. One of these is the high degree of standardization necessary to permit economical mass production of houses on assembly lines, as has been done with automobiles. By the trial-and-error plan, experience is evolving the "one best way" to arrange the interior of a standard house, allowing certain elements of flexibility that do not interfere with mass production. House locations, settings, and groupings can be varied according to the lay of the land, but to do so requires experience and study. The similarity of exteriors can

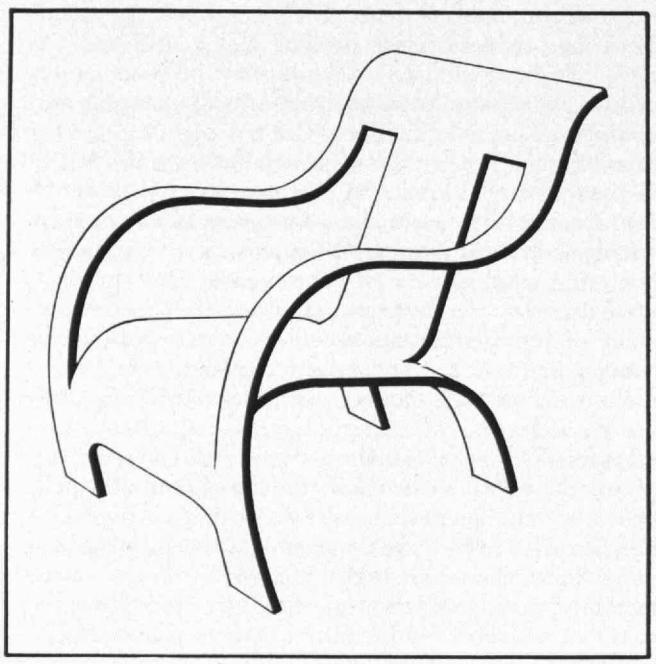
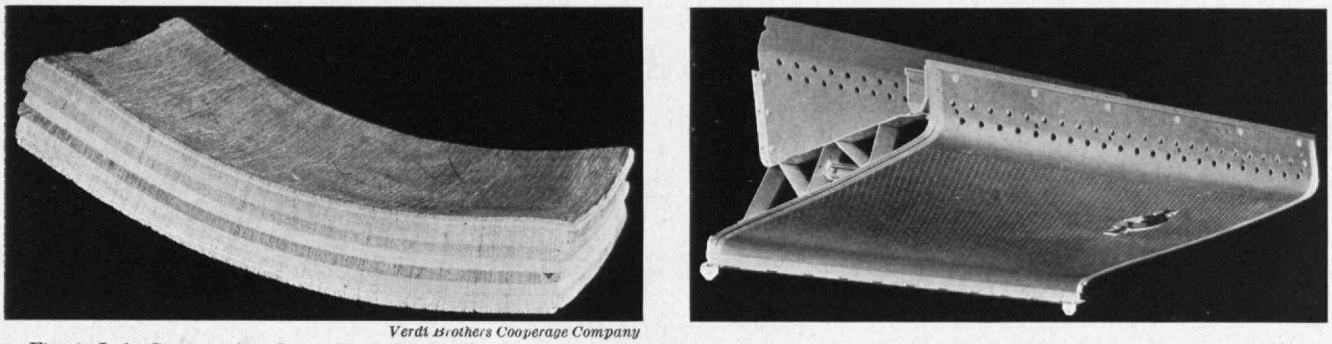


Fig. 2. Plywood chair made of one sheet of plywood cut and bent as indicated



Verdi Brothers Cooperage Company

Fig. 3. Left: Section of a plywood barrel stave. Bending each layer is far easier than bending a solid stave. Compound curvature, bonded in pairs of heated forms while the adhesive cures, results in maximum strength and stability. Right: Baggage rack, of combined plywood and fiber, preformed and perforated.

be relieved by inexpensive, artistic treatment of corners, by changes in entrances and porches, and so on.

As a matter of fact, we have for many decades enjoyed a considerable degree of prefabrication in houses. Doors, windows, frames, kitchen cabinets, and bathroom fixtures have been standardized for years. What is now needed is to push prefabrication farther into the factory until wall, floor, ceiling, roof, and other units are completely fabricated under manufacturing conditions and need only to be assembled and erected at the site by some simple mechanical process. Excellent progress in this direction has been made by several companies. If some master architect-engineer-manufacturer-promoter-salesman could devise a series of standard units which could be warehoused in convenient centers and then assembled into a wide variety of house designs, prefabrication would be able to render a far more dramatic service than it has so far done in accelerating our retarded housing program.

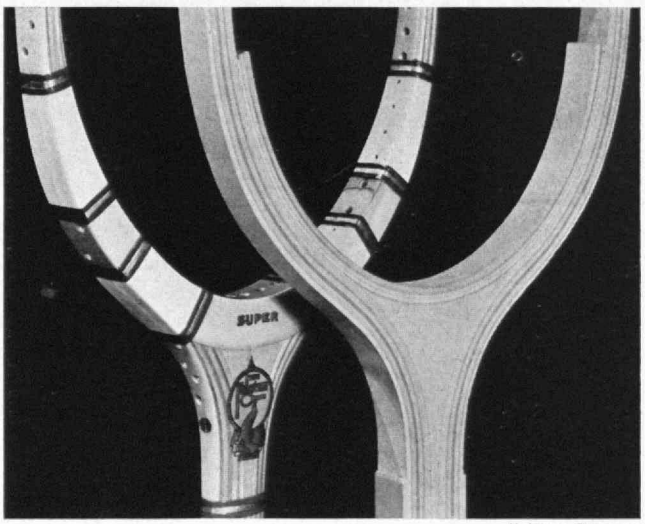
The magnitude of the possible savings in cost that could be realized from a progressive assembly line is impossible to predict. Turning out the units for 100 houses a day, or at the rate of 30,000 a year, would be a gigantic task, but until some such goal is approached, the full advantages of prefabrication will still lie beyond our reach. The generous area, light weight, sturdy qualities, and low cost of plywood remain unsurpassed for efficient prefabrication.

Furniture makers employ plywood in important surface parts of all their principal products — in the tops of tables, in fronts and bottoms of drawers, in backs of mirrors, in tops and ends of bureaus, in cabinets for radios and phonographs, in piano cases, and the like. Solid furniture has an appeal to some, and when well made is undoubtedly superior to a mediocre grade of plywood furniture. Custom-made furniture is usually solid and should have the benefit of the best craftsmanship. Hand labor in custom shops may excel in sincerity but is not likely to be equal to the accuracy of machine labor when the latter is combined with modern manufacturing skill and materials. After more than 30 years of close acquaintance with the woodworking industry, as a manufacturer, engineer, and user, the author ventures the assertion that furniture of an equal grade of workmanship, style, and material is distinctly more sturdy and attractive when plywood is utilized in its appropriate place than when the furniture is made of solid wood.

A word should be said about interior paneling in homes. While they are regarded as costly and difficult to obtain, there is no economic reason why plywood interiors cannot be utilized in modest homes, as well as in those more pretentious. Such paneling is far more durable and more easily maintained than lath and plaster but has never been adequately appreciated by the user, nor have proper and simple standards been promoted and made readily available by those who advocate the application of it in this way.

Some very interesting plywood furniture designs have recently been brought to us from the Scandinavian countries, as can be noted in Fig. 2, which shows a complete chair sawed and formed out of a single sheet of plywood. It is certainly unique. Similar processes and designs have since been used in other items of household furniture.

Among many industrial uses of plywood, only a few can be described here, with a brief mention of applications in other fields. In the container industry, for instance, plywood beer barrels have become recognized as standard. The plywood stave — a cross section of which is shown in Fig. 3 — can be preformed during gluing, is twice as wide as the solid stave and consequently halves the number of joints in the barrel, is not stressed at the bilge to near the breaking point, holds its compound curved shape rigidly, and does not (*Concluded on page 328*)



Fulcrum Company

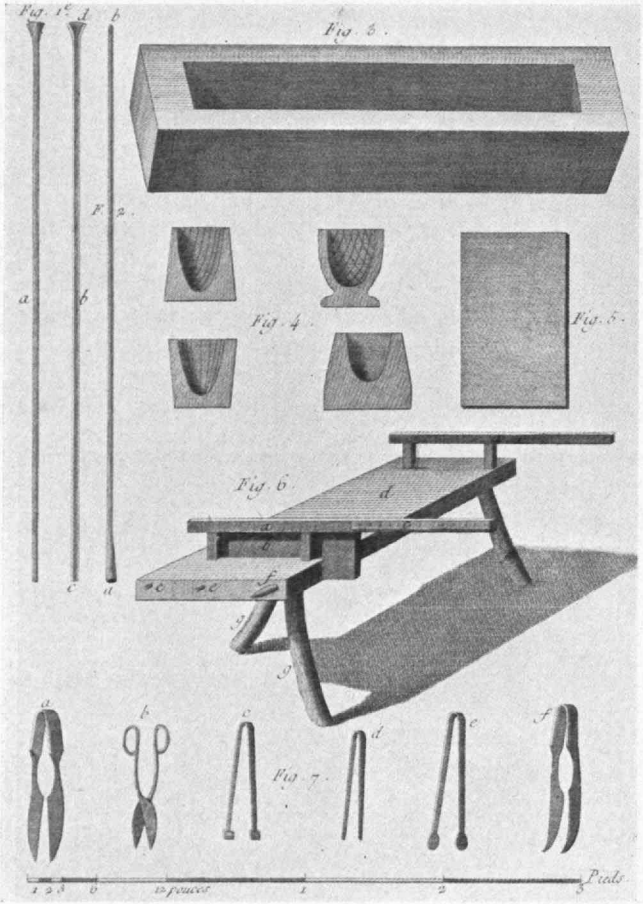
Fig. 4. Laminated tennis racket. Right to left, before and after finishing.

A Cloth of Glass

The Second Period of Nineteenth Century Massachusetts Endeavors in the Manufacture of Glass Offers Interesting Notes on Pioneering Industrial History

By Sterling Lanier

GLASS manufacture in Massachusetts, from its inception in 1783 to the end of its first era of expansion in about 1830, presented a record of experimentation, speculation, and financial failure. In Part I of the present survey (see The Review for April), two exceptions to the general trend were noted — the New England Glass Company and the Boston and Sandwich Glass Company, both of which produced some exceptional glassware during the major portion of the century of glassmaking in the commonwealth. Despite notable ups and downs — the stock of the New England Glass Company, with a par value of $500, ranged from $150 to $750 a share — these two firms were the constant in an industry overcrowded with variants.



Glassworker's tools as depicted in the Dictionnaire des Arts et Métiers, *1791: Fig. 1, glass blower's pipe; Fig. 2, pontil, or punty; Fig. 3, trough; Fig. 4, molds; Fig. 5, marver, the marble or iron slab on which the glass was worked; Fig. 6, the bench, or glassworker's armchair; Fig. 7, shears, shapers, and tongs.*

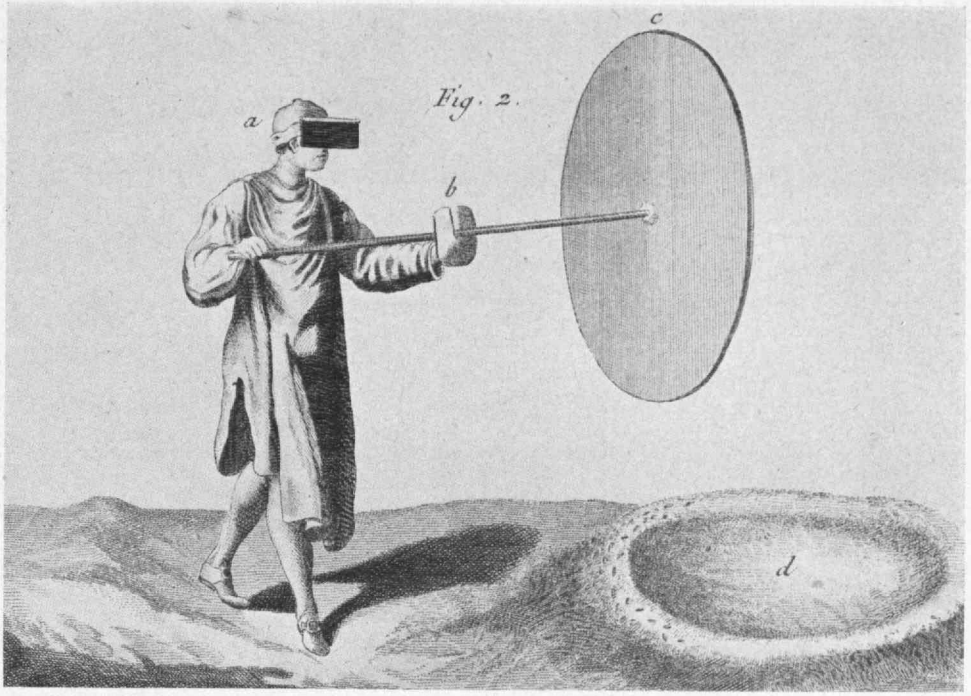
The second era, also speculative and financially unprofitable, although not so experimental, extended roughly from 1850 to 1875. This statement is borne out by a study of the census reports on glass manufacture from 1860 to 1910. The 1850 United States Census mentioned 232 glass manufacturers, but how this figure is related to the following table needs more clarification than is available.

Year of Census	*Number of Companies*	*Capital Involved*
1860	11	$1,656,000
1870	22	2,137,060
1880	11	823,000
1890	6	365,051
1900	5	258,949
1910	Glass manufacture no longer listed as an industry in Massachusetts	

The magnet which attracted such a large amount of capital in the 1850's and '60's was the idea, generally predominant, that glass would yield huge profits. True, it would. In 1863 the New England Glass Company made $120,000 on a capital of only $500,000, a profit of 24 per cent. But this was exceptional — even in a company with 46 years of experience behind it. Novices, misled by such rosy vistas, were quickly absorbed and disgorged by a business which was tricky and temperamental. Thomas Gaffield himself, from whose "Glass Journal" all quoted material not otherwise credited is taken, was aware through firsthand experience of what it cost to fail in manufacturing glass. He and his partner, James Tuttle, formed the Boston Crystal Glass Works in 1861 to manufacture cylinder glass, a new and very pure white building-glass which underwent a rolling and flattening process after being blown into cylinders. Cylinder glass was first introduced by the Berkshire Glass Company, but Gaffield and Tuttle felt that, since they were already glass merchants, they might as well make greater profits by manufacturing their own glass. So in 1860 land was purchased, plans and specifications for buildings were drawn up, contracts made, and men hired.

Before the story of the Boston Crystal Glass Works is related, a picture of the profits estimated by practical men will explain why so many dived into the glass sea before they had learned to swim. Here is the estimate of probable profits as figured by George Neale, manager of Boston Crystal:

Mr. Neale has calculated the produce of the factory as follows: 8 pots will make 200 cylinders each. Each cylinder contains 10 ft. 1600 cylinders



A glassworker about to position a plate of glass — flattened by centrifugal force as the punty is revolved — on the circular bed of embers (d) before removing the punty, which will leave in the center of the plate the familiar bull's-eye mark. From the Dictionnaire des Arts et Métiers.

per journey equal 16,000 ft., or 320 boxes of 50 ft. each. 50 weeks of 4 journeys [a week] equal 200 journeys. 200 × 320 equals 64,000 boxes of 50 ft. each. Deduct for breakage 4000 and we have 60,000 boxes at $5.00 each equal $300,000
Cost for all materials, wages, rentals, etc. 188,926

Annual profit $111,074

From which Mr. Neale would deduct the cost of packing boxes and straw not included in his estimate of expenses. If we say 11,074

There is left $100,000

A neat annual profit, to be sure — on paper. This estimate was not unusual. Two others were comparable, the first by Robert Squires, "a very good workman in his department." I have omitted the itemized costs for labor and materials, since only the totals are needed:

Costs of labor per week $1,833
Costs of materials per week 2,487

$4,320

Mr. Squires estimated that we could make from 6400 to 7200 rollers or cylinders per week worth on an average one dollar apiece, say $6400 per week. Deducting $4320, we have the interesting, but fabulous profit of $2180 per week [or, on a 50-week year, $109,000 per annum].

A third estimate, by Mr. Thomas of the Saxon Sheet Glass Company, was the most optimistic of all. Reckoning that seven blowers would get 100 cylinders per journey for four journeys a week at a minimum price of $1.50 per cylinder, he estimated thus:

Amount realized from glass per week $4,200
Cost per week 1,463

Profits per week $2,737
[Or, on a 50-week year, $136,850 per annum]

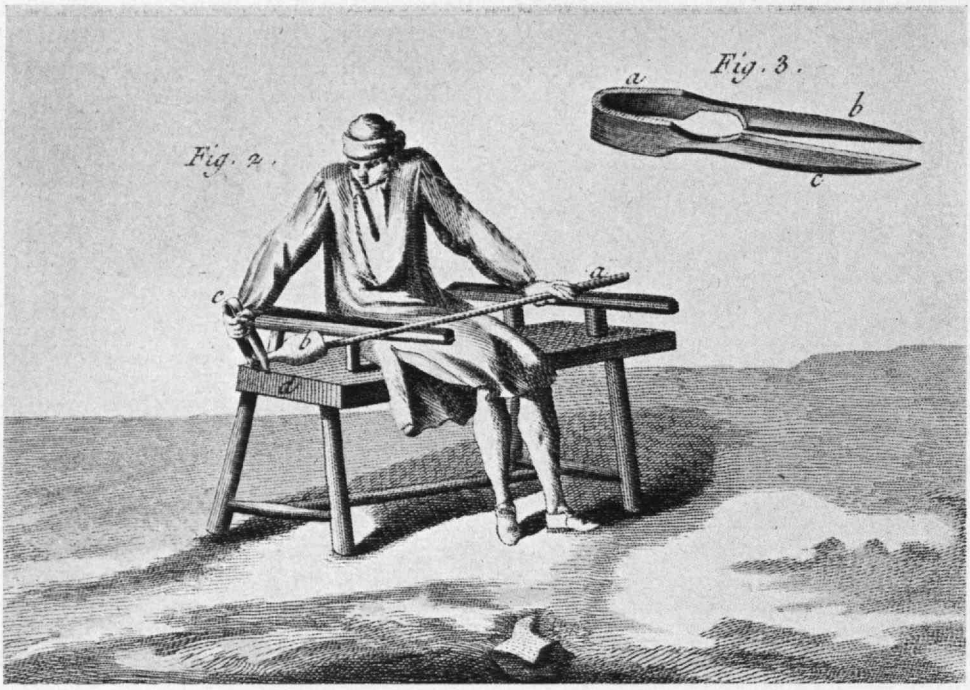
Enough has been said to show the fabulous paper profits which induced the soundest of businessmen to invest in the glass business. The actual results, however, were deficits, and large ones, as the story of Gaffield's own factory will show. The Boston Crystal was a typical, not an unusual, case. More often than not, I shall let Gaffield speak for himself.

LIST OF THE DIFFERENT CLASSES OF WORKMEN AND THEIR WEEKLY WAGES IN THE BOSTON CRYSTAL GLASS WORKS

No.	Workmen	Amount per Week	No.	Workmen	Amount per Week
14	Blowers	$450.00	1	Skimmer	$15.00
14	Gatherers	350.00	4	Packers	80.00
15	Block Boys	75.00	1	Splitter	20.00
3	Spare Boys	9.00	1	Rimmer Boy	5.00
1	Founder	25.00	6	Glass Carriers	30.00
4	Tiseurs*	64.00	4	Mixers	50.00
2	Coal Wheelers	36.00	1	Potmaker	14.00
1	Hole Filler	3.00	1	Clay Man	8.00
1	Blowing Furnace Man	16.00	1	Clay Boy	3.00
1	Door Boy	3.00	1	Blacksmith	16.50
9	Cutters	270.00	1	Blacksmith Striker	10.00
1	Assorter	30.00	1	Teamster	10.00
2	Pipe Minders or Carriers	6.00	1	Ostler	12.00
4	Jigger Holders	12.00	6	Laborers	54.00
2	Shovel Holders	6.00	2	Coke Cleaners	10.00
7	Flatteners	175.00	2	Watchmen	22.00
7	Push Boys	35.00	1	Coal Loader	9.00
3	Kiln Men	30.00	1	Brick Setter	9.00
1	Furnace Keeper	25.00	2	Glass Cleaners and Washers	6.00
	Total	$2,003.50			

* A *tiseur* was a stoker. American usage and pronunciation were sufficiently strong to change this word so that, even in United States Census reports, it appeared as "teaser."

From Thomas Gaffield's "Glass Journal" in the Institute Library, this tabulation of trades and wages in a mid-Nineteenth Century Massachusetts glass factory is an interesting glimpse into industrial and economic history.



A bottlemaker forming the neck of a bottle with pincers as he rotates it by rolling the punty back and forth on the arms of his "chair." From the Dictionnaire des Arts et Métiers.

The first attempt was brief and bitter. Work was started in July, 1860, and from then until March, 1861, when the first cylinder of glass was produced, the time was "busily occupied in the labors of carpenters, masons, wharf-builders, blacksmiths, painters, glaziers, coppersmiths, engine-builders, and other mechanics; in the purchase of sand, clay, coal, and other materials; in the preparation of furnace, flattening oven, pots, and in other arrangements for the manufacture; in fitting out a neighboring house as a boarding place for the men and in obtaining from different parts of the country (N. Y., N. J., Penn., and Mass.) a gang of workmen in the various departments."

Difficulties began to occur — "the usual and, perhaps, an unusual amount of errors and unfortunate experiments, almost always made in the commencement of a factory like ours": blast furnaces which did not work properly and resulted in broken pots and furnaces, ignorant managers who made yellow glass instead of the desired white, poor flattening stones, and many other troubles. In some 10 weeks of operation 3,545 boxes of glass were produced, of which 7¼ per cent were first class, 12½ per cent second class, 43½ per cent third class, 34¾ per cent fourth class, and the remainder still worse. Furthermore, the Civil War had just broken out and had already destroyed much of the American market for glass.

The works closed, and Gaffield set about learning somewhat of this business of glass manufacture. He took courses at the Lawrence Scientific School, studied scientific periodicals, and after stopping to visit some glass factories in New Jersey and Pennsylvania, set off for Europe to study those in England, France, and Belgium. After collecting voluminous reports, he returned to America for a second try at the Boston Crystal Glass Works. In October, 1863, work was started toward improving the buildings, seasoning pots, hiring workmen in England and America, and buying materials. Not the least of the difficulties with which Gaffield had to contend was the morals of the workmen. Men were surreptitiously enticed from one company to another by promise of better wages, and evidently the demand for good workmen was great enough so that positions were always available. Hence workmen assumed an arrogant attitude, took liberties, and generally made things difficult for employers — increasingly so, as the period advanced. Gaffield was warned of this by a Mr. Hay, who "spoke of the English workmen as men who drank profusely, one blower actually taking some 20 bottles of porter while blowing out one melt."

Excerpts from Gaffield's journal between June, 1864, and April, 1866, show clearly the trials and frustrations of the would-be glass manufacturer. The fabulous profits were always promised — always just around the corner. Meanwhile costs mounted.

June, 1864: We have some few matters yet to attend to before starting, but hope to be ready in July.

October, 1864: We shall not open our Factory for some time for several reasons.

November 19, 1864: This afternoon Mr. Tuttle and I visited the Factory, and saw the first trial of one of the flattening ovens. . . . Everything worked to a charm.

November 25, 1864: This afternoon Mr. Richmond and Mr. Leach went to the Factory and saw the second flattening oven in operation. . . . Everything worked well. The glass flattened on the first has been brought to the store and is rather too crowning, but the difficulty was occasioned, Mr. Neale says, by the oven not being hot enough last Saturday, which is frequently the case on the occasion of a first heat.

February, 1865: We have carefully considered the subject of opening our Factory in all of its aspects, including our want of a stock of large sized glass, our loss of interest and reputation by keeping our Works closed, and the importance of making, at least, an experiment, and ascertaining whether the business of manufacturing will pay or not; and we have decided, if possible, to commence in May or June. In consequence of a miscalculation of Mr. Neale concerning the number of flattening kilns necessary for our work . . . we shall have to erect a new kiln in his new (*Continued on page 332*)

Detection Deep Down

How the Geophysicist Identifies the Inaccessible Crustal Rocks of the Earth by Applying Analytical Methods to Laboratory Data

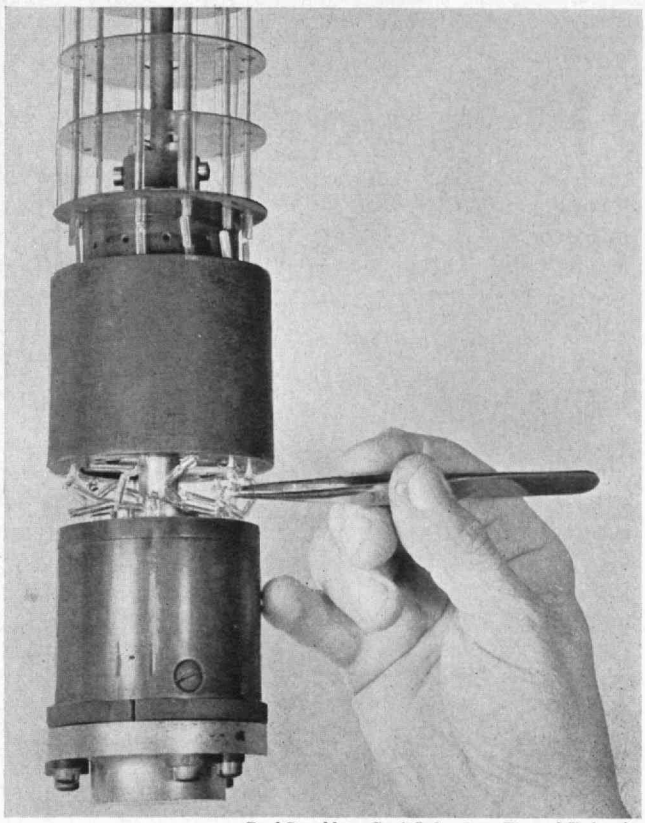
By Milton B. Dobrin

EVER since the earliest days of civilization, philosophers and scientists alike have conjectured about the nature of things below the surface of the earth. The ancient Egyptians, for example, conceived that not too far beneath them stood a gigantic elephant supporting the visible earth on its back and being supported, in turn, by a tortoise. In more recent times, with the sphericity of the earth established, the belief came to be generally held that, below a superficial outer shell, the entire interior of the planet was an ocean of molten lava. The considerably different concept that is accepted today is still speculative to a large extent, but the methods by which it has been pieced together illustrate how the ingenuity of modern physical science has projected man's perception into a part of his environment which until recently appeared to be forever inaccessible.

The deepest oil well in the world extends less than three miles downward. From direct observation and judicious extrapolation, the geologist can give us a fairly complete and reliable picture of what may be expected to depths of this order in various areas of the world. But if he wishes to determine the nature and constitution of the material more than a few miles below the surface, he must turn to the geophysicist, whose methods of working have of necessity been comparable to those of a master detective engaged in solving a difficult case. The whole history of man's recent efforts to plumb the earth's depths is a huge detective story, in which the action is still going on and in which the major mysteries will never be completely solved. Thus far, the most encouraging progress has been made in unraveling many questionable threads of evidence pertaining to the outermost 30 miles or so, the portion that is known as the earth's crust.

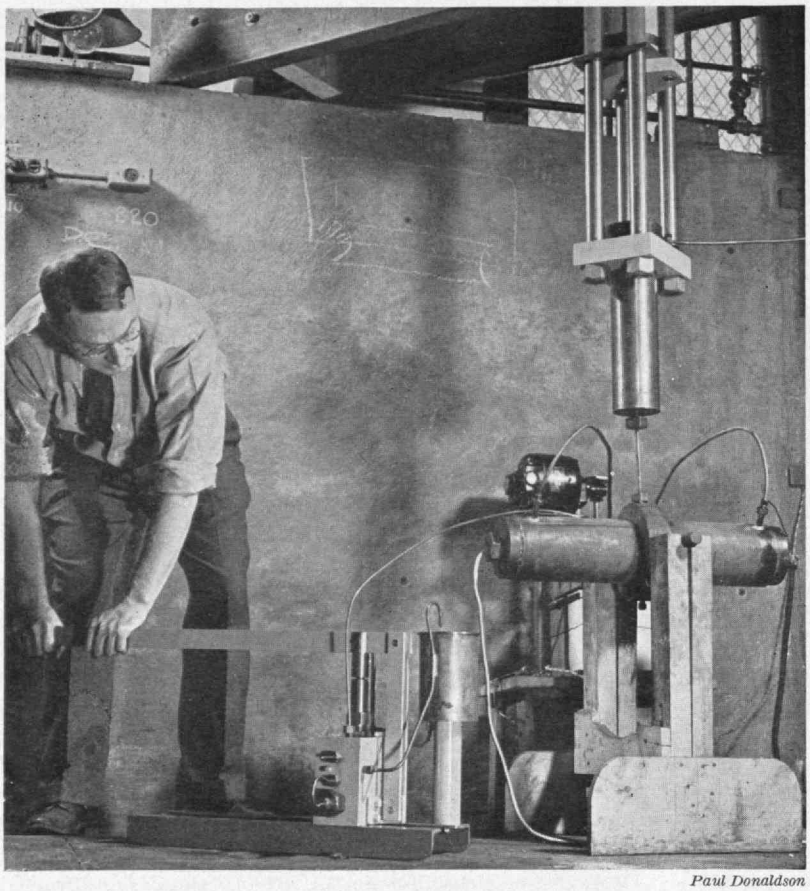
The question naturally arises whether any reasons other than purely philosophical ones can be adduced for carrying on such painstaking and apparently difficult investigations into the structure and constitution of the earth's lower regions. There is, of course, little hope at this time of realizing any financial return from such research; the rewards are of quite a different character. The geologist needs information of this sort to understand the present configuration of the earth's surface and to deduce the mechanism for the slow but constant changes that have taken place in it all through the history of our planet. The explanation for the formation of mountains and ocean deeps must be sought far below their visible exteriors. With more information about the character of crustal rocks, it might be easier to tell, for example, why the Scandinavian peninsula has been rising at the rate of one centimeter a year since the departure of the great glaciers. Such knowledge gives the geologist a greater insight into the cause and nature of earthquakes — phenomena which are as much of practical importance as they are of academic interest.

The geophysicist wants to answer three principal questions about the earth's interior: First, he would like to know the chemical composition of the rock material and how it changes with depth. Second, he is interested in ascertaining whether this material exists in a crystalline, vitreous, or liquid state. Finally, he is looking for data on the temperatures, pressures, and mobilities encountered at various depths. All of these questions are closely related. In his attack on such problems, he has been aided to a tremendous extent by past and present volcanic action, which has brought up countless samples of rock material from great



Paul Donaldson, Cruft Laboratory, Harvard University

For time-consuming measurement of the heat conductivity of rocks, specimens are enclosed in the copper blocks of this apparatus.



Paul Donaldson

Laboratory determination of the velocity of earthquake waves in various rocks under high pressure and temperature gives basis for the identification of earth structures from seismological records. Here Francis Birch uses apparatus for direct laboratory measurement of velocities in small rock samples, applying pressure magnified by the overhead press to several thousand atmospheres — equivalent to natural pressure 10 or 20 miles underground.

depths for convenient scrutiny and analysis. Indeed, these igneous rocks, as they are called, are found at or near the surface all over the world and exist in thousands of forms, each type with its peculiar physical structure and chemical composition. Although there is always the possibility that phases unknown at the surface may exist at great depths, most of the crustal rocks are believed to be similar in constitution to the samples found on the surface. If so, the major problem becomes one of recognition and identification.

The most valuable clue to identification, for those with the skill to read them, lies in messages which are continually arriving from the layers existing at various depths within the crust and even from the zones far below its base. The messages are transmitted by the seismic waves generated by earthquakes, both natural and artificial. Such a wave is picked up by seismograph stations all over the world, and by comparison of the times at which various components of the wave arrive at different stations the seismologist can calculate the velocities at which it has traveled through all the mediums between its source and the recording station. Even when the origin of the seismic wave is at or near the surface, the fact that the wave travels downward into the earth and then back to the surface in approximately a circular path makes shallow earthquakes especially valuable in ascertaining the speeds in the first 50 miles or so below the surface. Not all the seismologists have been patient enough to wait for real earthquakes to give them data on the speeds within the crust in those parts of the world which have been of interest to them. Instead, some have created their own earthquakes in the form of quarry blasts or dynamite explosions and have recorded the resultant shocks with seismic detectors often placed at considerable distances from the source. Louis B. Slichter, Professor of Geophysics at Technology, has carried on some successful measurements of this sort in New England with detectors over 100 miles from the initial disturbance. L. Don Leet, assistant professor of seismology at Harvard, has measured speeds in several rock formations within the same region over comparable distances, and Beno Gutenberg, professor of geophysics at the California Institute of Technology, has brought to light some valuable although puzzling data on the speeds in crustal formations in southern California.

From calculations based on all these types of seismic measurements, the fact has become well established that several discontinuities of speed occur within the crust, the first important one being at a depth of about nine miles, and the last, which is believed to represent the base of the crust, at about 35 miles. The inference has been drawn, and is still held, that these discontinuities of velocity represent boundaries of discrete layers, each of a different material or perhaps of a different phase, extending around the globe in approximately concentric shells.

When the existence of such shells was inferred from seismic evidence, the next problem was to determine the constitution of each shell. At this stage, detective methods had to be called into play. The attack that has been adopted can best be likened to the technique of identifying a criminal suspect from his fingerprints. It consists in the determination, by laboratory measurements, of the seismic speeds to be expected in a great many samples of different igneous rocks and in the comparison of the results with the actual speeds calculated from seismic records. Of course, the analogy to fingerprinting is oversimplified, for a man's fingerprints do not change when he moves to a different climate, whereas the seismic speeds in rock specimens are greatly affected by the variations in pressure and in temperature associated with changes in depth.

The chief problem in laboratory measurements of this type is, therefore, to reproduce the pressures and the temperatures found at various depths. Both increase very rapidly as we go down. At a depth of 10 miles, the pressure is about 56,000 pounds per square inch, and the temperature about 350 degrees centigrade. At 20 miles, the pressure is 125,000 pounds per square inch, and from rather fragmentary evidence the temperature is estimated to be about 600 degrees centigrade. At

pressures of this magnitude, all but the hardest metals would be crushed beyond their limit of elastic deformation even at ordinary temperatures, and obviously the reproduction of conditions existing at even moderate depths is a task of utmost complexity. The design of high-pressure apparatus for such measurements thus becomes a high-powered engineering problem.

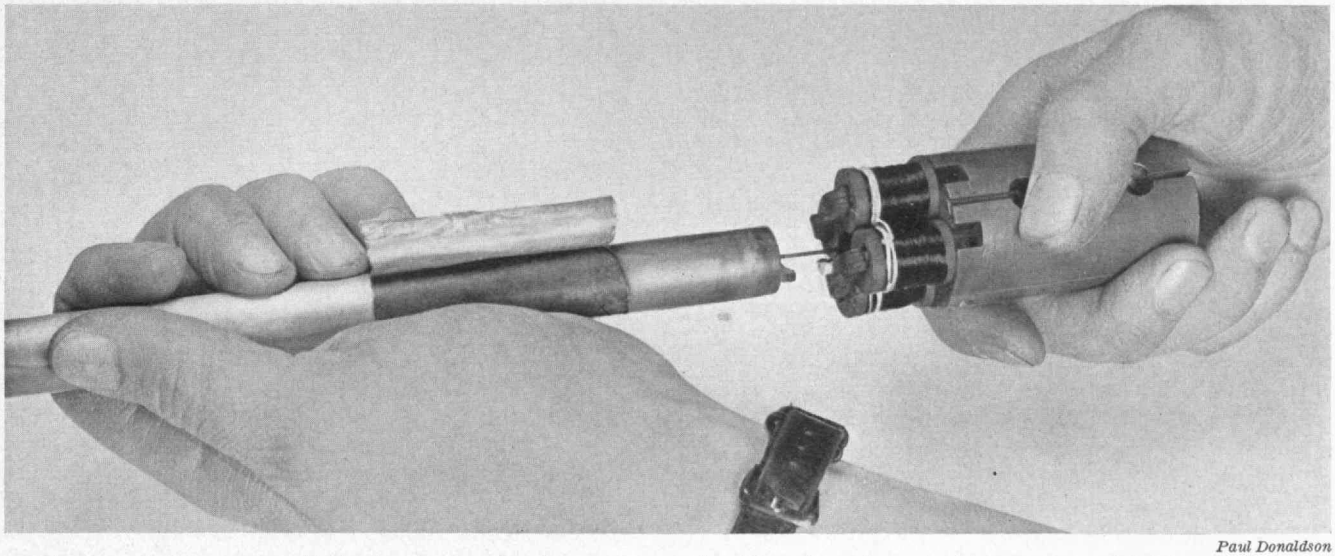
Moreover, with the small samples which are tested in the laboratory, no practical method is known for directly measuring the seismic-wave velocities. Instead, it is necessary either to determine resonance frequencies or to make use of the theoretical relationships between the elastic constants and the velocities of sound waves in solid mediums. These constants are the same as those with which a designing engineer must reckon when calculating the strength of a structure, and usually they can be measured by standard testing apparatus. Among them are the compressibility, which is the fractional decrease in the volume of a solid upon application of a unit of confining pressure; Young's modulus, which is the fractional increase in length upon application of unit tensional stress; the shear modulus, which is the angular deformation produced by a unit twisting stress; and Poisson's ratio, which is the ratio between the fractional decrease in width and the fractional increase in length when an elastic body is stretched in the direction of its length.

If these quantities are known for any solid elastic material, such as a rock specimen, then it is possible to calculate the velocities of longitudinal and transverse sound waves through any body composed of that material. When the waves are longitudinal, the direction of the vibratory motion within the medium is the same as that of the propagation of the wave itself. When the waves are transverse, the motion of the vibrating particles is perpendicular to the direction of wave propagation. So much for our necessary definitions. All four elastic constants and the velocities for the two types of waves are so interrelated that if any two of the constants are known, the other constants and the wave velocities can be calculated. Furthermore, if the two wave velocities are known, the elastic constants can be computed.

The procedure which the geophysical detective actually employs is to work in two directions at once. From seismic evidence, the longitudinal and transverse speeds within various crustal layers can be readily determined and the elastic constants solved for in terms of them. Then laboratory measurements are made on many different types of rock in apparatus creating as far as possible the hydrostatic pressures and the temperatures comparable to those at various depths within the crust. The elastic constants thus determined are compared with those calculated from seismic data; then by matching the two sets of results, one tries to deduce the composition and structural state of the various crustal layers.

The first significant work on this problem was carried on in the early 1920's by Leason H. Adams and his colleagues in the geophysical laboratory of the Carnegie Institution of Washington. They measured the compressibility of numerous metals, rocks, and glasses at pressures ranging from 28,000 to 170,000 pounds per square inch. The latter pressure corresponds to that encountered at a depth of more than 25 miles. Since only one constant — the compressibility — could be measured by their apparatus, a value for the second had to be assumed in order to compute the velocities. The results, therefore, were not precise enough for accurate identification of crustal layers, but they did indicate that known surface rocks are sufficiently elastic at high pressures to account for speeds as great as any which seismologists assigned to the deepest layers of the crust.

Since this pioneering stage in the investigations to identify the crustal layers, a large part of the progress has been made in the laboratories of Harvard University during an extensive program of research sponsored since 1931 by the university's committee on geophysical research. Among the Harvard (*Continued on page 336*)

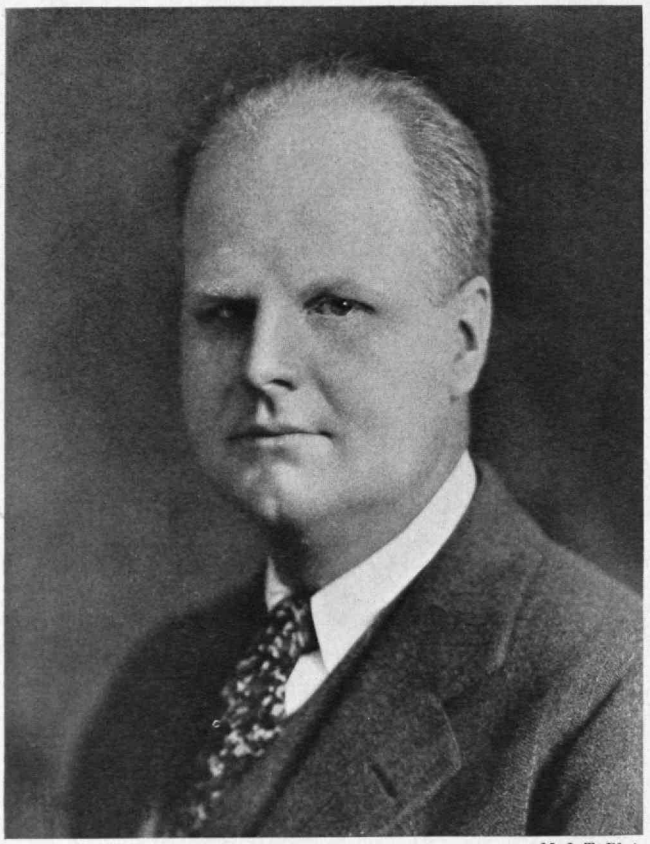


Paul Donaldson

Vibrations similar to various kinds of natural earthquake waves are produced in rock specimens by this apparatus. At left is a cylinder of rock with its foil coating torn back; at right is the electrical mechanism by which torsional vibrations are applied to the cylindrical specimen. Velocity of the waves in the rock is given by determination of the resonant frequency of the specimen.

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE



M. I. T. Photo

LEICESTER F. HAMILTON, '14

Acting Head of the Department of Chemistry

For Research

FREDERICK G. KEYES, Head of the Department of Chemistry at the Institute, has temporarily relinquished his duties as head of the Department in order to devote full time to important research undertaken at the request of the United States Government, President Compton has announced. To serve as acting head of the Department during Dr. Keyes's leave, the executive committee of the Corporation has appointed Leicester F. Hamilton, '14, Professor of Analytical Chemistry, who has been in charge of undergraduate instruction in chemistry.

Since last year Dr. Keyes has been engaged in a program of war research of great importance. His contribution to chemical research in this war recalls his activity in the last war, when he served as major in the Chemical Warfare Service and as director of the Chemical Warfare Service laboratory at Puteaux, France. He was cited by General Pershing for his outstanding work in this field.

For "distinguished achievements in chemistry," Dr. Keyes is to receive on May 14 the 1942 Theodore William Richards Medal, highest award of the northeastern section of the American Chemical Society. He is internationally known for his achievements in measuring with high precision the physical properties of fluids. An example of much practical value is the measurement of the properties of steam at high temperatures and pressures, which made possible advances in steam-turbine design to a point where enormous savings in coal have been realized. An accurate knowledge of the physical properties of fluids is of great importance in the arts and in the progress of science. For his contributions in this field, Dr. Keyes was awarded an honorary degree of doctor of science by Yale University in 1934. He also devised and perfected a direct method for determining the characteristic constants of molecular interaction in pure gases and mixtures of gases, which resulted in the development of a gas refrigerating machine. He is likewise well known for advances in the development of quartz lamps and heat-resisting glasses.

Professor Hamilton, who now becomes acting head of his Department, has been a member of the teaching staff of the Institute since 1914 and in charge of undergraduate instruction in chemistry since 1935. Born in Medford, Mass., he prepared for Technology in the public schools of Medford, and the autumn after his graduation in 1914 he joined the staff as an assistant in analytical chemistry and military science. He has always taken an active interest in undergraduate life at the Institute, and since 1925 he has been chairman of the Dormitory Board. As a member of the American Chemical Society, Professor Hamilton served as secretary of the northeastern section from 1920 to 1922. He is also a member of Alpha Chi Sigma, honorary chemical society, and is coauthor of two books, *Calculations in Quantitative Chemical Analysis* and *Analytical Chemistry.*

Dial Tones

THE Institute's telephone system, which now serves some 6,000 persons and includes 1,000 instruments of its own and 1,010 instruments of the New England Telephone and Telegraph Company, was changed to the dial system on April 11, with President Compton dialing the first call. Preparations began last summer for the construction of the new dial switchboard, which is comparable to installations serving sizable communities. The completion of it under war conditions was a triumph of efficiency and co-operation.

In March, 1936, the Institute's switchboard, with three operators, handled 12,700 local calls. In the same month four years later, the traffic load had increased to 22,500 calls, handled by four operators. With the approach of war and the rapid expansion in research, 24,500 calls went through the switchboard in March of last year, 2,500 over a separate auxiliary switchboard

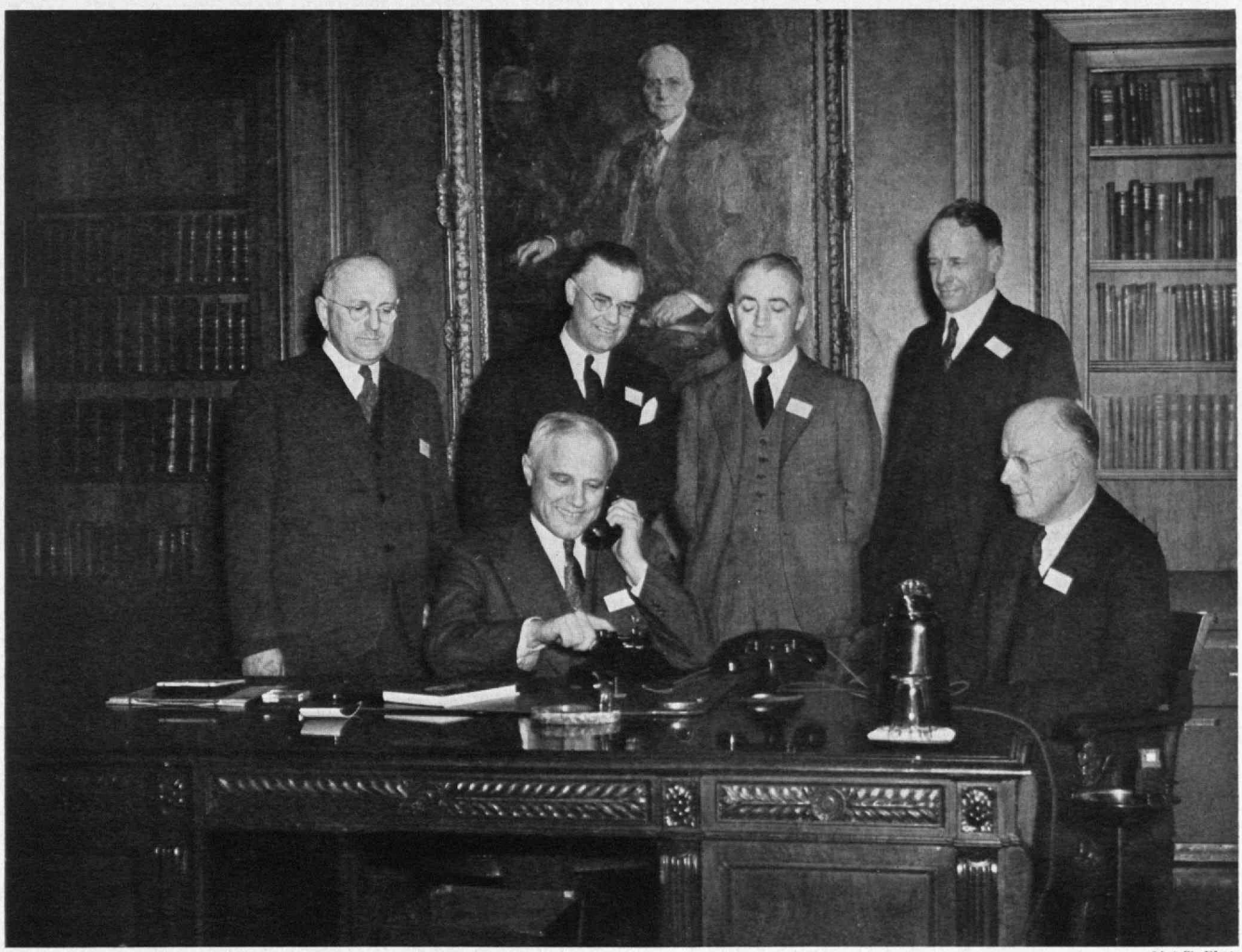
in one of the war research laboratories. In the same month this year, the total was 27,000 calls on the main switchboard and 21,000 war-research calls over separate branch exchanges and direct lines. It was this heavy increase which brought about the decision to install a dial switchboard to provide internal and local outgoing service and direct-line communication to eight other branch exchanges without employing the services of an operator. The Institute's operators now handle only outward toll calls, incoming calls, and inquiries for information.

The new dial switchboard is unique in one respect, in that all its telephones are classified by Departments, using numbers corresponding to the long-established Course designations. Installation of the new switchboard at this time was made possible by the very effective co-operation of the New England Telephone and Telegraph Company and the efficient liaison services of Professor Carlton E. Tucker, '18, of the Department of Electrical Engineering, who is an authority on the Institute's telephone system.

Speakers at the ceremony which marked the change to dial operation from the manual system in force since 1916 included President Compton; John J. Robinson, President of the New England Telephone and Telegraph Company; Professor Tucker; and Delbert L. Rhind, Institute Bursar. The guests included a large group of telephone officials covering every department involved in the construction of the new system. Among them were Frank A. Benham, '06, chief engineer; Francis A. Barrett, '24, publicity director of the company and President-elect of the Alumni Association of the M.I.T.; Harris B. McIntyre, '22, toll-rate engineer; and John C. Walsh, service representative. Other guests were the Institute's telephone operators headed by Albina F. Ahearn, chief operator, whose association with the Institute's telephone system began in 1916 when she came to Technology as the first operator upon completion of the new buildings in Cambridge.

Honored

THE Franklin Medal and a certificate of honorary membership, the highest awards of the Franklin Institute, were presented to Jerome C. Hunsaker, '12, Head of the Departments of Aeronautical Engineering



M.I.T. Photo

President Compton puts through the first call as the Institute's telephone system enters dial operation. Seated at the right is John J. Robinson, President of the New England Telephone and Telegraph Company. Standing, from left to right, are Carlton E. Tucker, '18, Professor of Electrical Engineering; Delbert L. Rhind, Bursar; Francis A. Barrett, '24, President-elect of the Alumni Association and publicity director of the New England Telephone and Telegraph Company; and Edward L. Moreland, '07, Dean of Engineering.

Fortune

FREDERICK G. KEYES

Fortune

JEROME C. HUNSAKER, '12

Honored by the award of medals are these two members of the Institute's Faculty. Professor Hunsaker, Head of the Departments of Mechanical Engineering and Aeronautical Engineering, is the recipient of the Franklin Medal of the Franklin Institute. He is at present on leave of absence for work in the service of the government. Professor Keyes, who has temporarily relinquished his duties as head of the Department of Chemistry in order to devote full time to research undertaken at the request of the government, is to receive this month the Richards Medal of the northeastern section of the American Chemical Society.

and Mechanical Engineering, at the annual medal day exercises in Philadelphia on April 15. Dr. Hunsaker is chairman of the National Advisory Committee for Aeronautics and represents that committee and the United States Navy on the advisory council of the Office of Scientific Research and Development, of which Vannevar Bush, '16, is director. Dr. Hunsaker is on leave of absence from Technology in order to devote most of his time to the service of the government.

A graduate of the United States Naval Academy, he very early became identified with research on aeronautical design. It was he who designed the famous NC-4, the flying boat which made the first crossing of the Atlantic. He was also designer of the dirigible *Shenandoah*, the first ship of its type to use helium gas. Following studies abroad after receiving his master of science degree from Technology in 1912, Dr. Hunsaker returned in 1914 to M.I.T., where he spent three years in wind-tunnel research on fundamental problems of aircraft design. At this time he established the Institute's pioneering Course in Aeronautical Engineering. He received the degree of doctor of science from the Institute in 1916. Recalled to the Navy in that year, he was placed in charge of the aircraft division of the Bureau of Construction and Repair. For this war work he was awarded the Navy Cross. Dr. Hunsaker returned to the Institute in 1933 as head of the Department of Mechanical Engineering.

Faculty Changes

THE annual list of promotions and changes on the Institute's staff, which was announced last month, includes the names of four widely known members of the Faculty who are to retire this year.

Samuel C. Prescott, '94, Dean of Science and Professor of Industrial Biology, who has been on the staff for 47 years, will retire on July 1. He has been appointed an honorary lecturer in Biology for next year. Dr. Prescott, who joined the staff of the Institute in 1895, was appointed head of the Department of Biology and Public Health in 1922 and dean of science in 1932.

Hervey W. Shimer, Professor of Paleontology in the Department of Geology, will retire after 39 years of service. Tenney L. Davis, '13, Professor of Organic Chemistry, retires from the Department of Chemistry, of which he has been a member 23 years. M. deKay Thompson, '98, Professor of Electrochemistry, will retire from the Department of Metallurgy after 44 years on the staff.

Professor Walter G. Whitman, '17, Head of the Department of Chemical Engineering, has been granted a leave of absence to accept a post in the organization of the War Production Board. During his absence Professor Warren K. Lewis, '05, long a member of the Chemical Engineering faculty, will serve as executive officer of the Department.

Faculty members promoted to the rank of professor include Charles W. MacGregor, Department of Mechanical Engineering; W. Rupert Maclaurin, Department of Economics and Social Science; Hans Mueller and Wayne B. Nottingham, Department of Physics; John T. Norton, '18, Department of Metallurgy; and Edward S. Taylor, '24, Department of Aeronautical Engineering.

Members of the Faculty advanced to the rank of associate professor are Archibald W. Adkins, '29, and Alvin Sloane, '35, Department of Mechanical Engineering; Morris Cohen, '33, and Carl F. Floe, '35, Department of Metallurgy; Prescott D. Crout, '29, Department of Mathematics; Truman S. Gray, '29, Department of Electrical Engineering; William C. Greene, Department of English and History; Henry G. Houghton, Jr., '27, Department of Meteorology; M. Stanley Livingston, Department of Physics; Douglas M. McGregor, Department of Economics and Social Science; Ronald H. Robnett, Department of Business and Engineering Administration; and Irwin W. Sizer, Department of Biology and Biological Engineering.

Promoted to the grade of assistant professor are Lawrence B. Arguimbau and J. Albert Wood, Jr., Department of Electrical Engineering; Lynwood S. Bryant and George de Santillana, Department of English and History; William W. Buechner, '35, S. Quimby Duntley, '33, Clark Goodman, '40, and Charles F. Squire, Department of Physics; Herbert F. Goodwin, '37, Department of Business and Engineering Administration; Christian E. Grosser, '32, and Brandon G. Rightmire, '41, Department of Mechanical Engineering; Delbar P. Keily, '34, Department of Aeronautical Engineering; John H. Lutz, Charles A. Stokes, '40, Scott W. Walker, '40, and Glenn C. Williams, '40, Department of Chemical Engineering; Eric Reissner, '38, Department of Mathematics; John C. Sluder, '41, Department of Biology and Biological Engineering; Clark C. Stephenson and Alberto F. Thompson, Jr., Department of Chemistry; Walter L. Whitehead, '13, Department of Geology; and J. Edward Vivian, '39, director in the School of Chemical Engineering Practice.

Appointments to the grade of instructor include those of Malcolm S. Burton, Department of Mechanical Engineering; Godfrey T. Coate, William R. Saylor, '41, and Marvin B. Sledd, Department of Electrical Engineering; David G. Edwards and Hewitt G. Fletcher, Jr., '39, Department of Chemistry; Kurt S. Lion, Department of Biology and Biological Engineering; Guy T. McBride, Jr., Department of Chemical Engineering; J. Wallace McBride, '40, Department of Aeronautical Engineering; and Robert V. Rosa, Department of Economics and Social Science. William C. Bauer, '41, and James D. McNitt, '41, are appointed directors in the School of Chemical Engineering Practice, and David Herron, '41, and Hugh W. Schwarz, assistant directors.

Reminiscences

WHEN, in 1893, the first Chicago world's fair had Americans agog, Technology students naturally wanted to see the show. How a group of them journeyed from the Institute to the fairgrounds and back in the good ship *Cadet* is recounted for The Review by Bertrand R. T. Collins, '88, then an instructor at the Institute, who arranged for the voyage. Mr. Collins' narrative, which follows, will recall the story of the M.I.T. expedition to the Centennial Exposition in Philadelphia in 1876, as reported in The Review for January, 1940.

The Cruise of the Cadet

BY BERTRAND R. T. COLLINS

SPECIAL trains, special hotels, special excursions, and all other kinds of specialties were in the air in the spring of 1893 as people planned on how to visit the World's Columbian Exposition at Chicago, which was to open on May 1. At Technology a group of instructors formed an organization called the "Technology Steamer Excursion to the World's Fair," of which I was elected treasurer. After negotiations had been undertaken for the chartering of the steamer *Cadet*, a 96-foot screw-propellered vessel offered by the Casco Bay Steamboat Company of Portland, Maine, and estimates of cost had been secured, the idea of a Faculty excursion did not appear workable, for a good many instructors had formed other plans. Consequently, I decided to go ahead with the scheme if a group of students should prove to be interested.

President Walker endorsed the idea, and so I completed arrangements with the steamboat company through Charles W. T. Goding, its general manager. Mr. Goding took a lively interest in the plan and agreed to paint a silver-gray band around the smokestack of the vessel with a large cardinal-red "T" on either side, as well as to furnish flags and streamers for decoration and to supply tenders for use between the shore and the vessel as she lay anchored off Jackson Park, Chicago. The *Cadet* had been designed as a private steam yacht and was originally at West Point on the Hudson River, which fact accounted for her name. For the excursion she carried a crew of 12. Licensed to carry 250 day passengers, she had ample deck room, and her accommodations were of the highest quality.

At first it had been thought that the entire journey in both directions might well be made by water. Since this scheme would have required at least six weeks, including 12 days at Chicago, and since the vessel had to return to Portland to resume her regular activities by July 1, we found it better to have her precede the party as far as Buffalo, where the passengers would board her for the trip to Chicago and back to Boston. Another reason for this alteration of the original plan was the fact that some of the passengers had to take final examinations on May 31, Columbian Exposition or no Columbian Exposition.

Consequently, the ship left Portland on May 18, went outside Cape Cod, into Long Island Sound, picked up at New York her pilot for the Hudson River and the Erie Canal, and started up the river. At Schenectady, time had to be allowed for a stop to take down the smokestack and remove the roof of the pilothouse so that the vessel might pass under the New York Central Railroad bridge, the lowest of the 720 bridges over the canal for its entire length from the Hudson to Lake Erie. In addition, 72 locks had to be passed through, the shortest of which gave the 96-foot vessel just two feet of play and the narrowest of which exceeded her 16½-foot beam by only 18 inches. The skill of Captain McIntire, the pilot, was such that no delays were encountered in passing through the canal, even though we were limited by law to a speed not exceeding six miles an hour. I do not now conceal that during the hours of darkness this speed limit was occasionally for-

gotten and the *Cadet* pushed on more swiftly, followed by a veritable tidal wave resulting from the fact that the canal had a standard width of only 70 feet at the water line, with a minimum depth of only 7 feet, the latter figure exactly equaling the *Cadet*'s draft.

The vessel managed to arrive in Buffalo 24 hours before the passengers, who included the following Massachusetts students and guests: Ernest M. A. Machado, '90, Ambrose Walker, '91, Harry W. Gore, '93, Warren D. King, '93, Harold M. Mott-Smith, '93, George Taylor, '94, George L. Bixby, '95, George A. Cutter, '95, Andrew D. Fuller, '95, Albert Geiger, '95, George W. Hayden, '95, John F. Brooks, '96, Albert Chittenden, '96, Harry W. Dyer, '96, Louis A. Freedman, '96, William H. Keith, '96, Alf C. Lootz, '96, Cecil H. Low, '96, Clement B. Tower, '96, Edward S. Wiard, '98, L. Tower, Jr., and H. B. Tower. I made the 35th man in addition to the 20 students, 2 guests, and 12 crew members.

The overland journey of the Technology contingent of our ship's company had begun on the evening of May 31 and was without incident, save for a considerable amount of public attention which was stirred up by the various Tech cheers given at stations where the train stopped. Arriving at the dock at the foot of Main Street in Buffalo where the *Cadet* lay, we went aboard shortly after noon on June 1, being greeted by the booming of a mahogany-based 12-gauge bronze saluting cannon.

After a hearty dinner, during the ingestion of which we were watched with a great deal of curiosity by a crowd of 100 or more gathered on the wharf, we steamed out of the dock to the booming of cannons, the fluttering of flags, and the vociferous clamoring of Tech cheers, and were soon out on the wide expanse of Lake Erie. During the afternoon and the following night, a considerable degree of seasickness complicated matters for most of the ship's company. In the afternoon of June 2, we stopped at Detroit to take on bunker coal and thus had an opportunity to inspect much of the city. Altogether our impression of Detroit was very good. We cast off from the wharf at 7:00 P.M., proceeding north toward Lake St. Clair, which we soon reached and crossed in about 2½ hours. We passed through a channel with embankments on either side and rows of willow trees, which led us into the St. Clair River.

A thick fog came on. Just after a crowd of us on the forward deck had been cheering one of the several brilliantly illuminated clubhouses we were passing on our port, we ran hard and fast onto a mudbank. This incident occurred at a little before 10:00 P.M. Although we immediately reversed the engine, we could not get off. On the blowing of four whistles, a boat with five or six fellows on board put out to us from one of the clubhouses. They told us that an excursion launch would return to the clubhouse about midnight and perhaps she would pull us off. A little after twelve the launch *Foam* came down river, came alongside, and attempted to pull us off the mudbank, but gave up after trying 15 or 20 minutes. For his efforts the captain received $2.00, and said he would notify a tug which was lying just below. The tug *Fannie Tuthill* came to our assistance about 1:00 A.M. After breaking one of our hawsers, pulling a cleat out of our deck, and pulling and hauling for 20 minutes, we came off the mudbank. We ran out into the channel and dropped anchor.

About half past three, it being gray dawn, our pilot thought he would proceed, although it had been agreed with Captain Fisher (captain of the *Cadet*) not to move till the fog lifted. In less than three minutes after weighing anchor, we ran onto another mudbank. The mate and a waiter were sent back at once in the dinghy for the tug which took us off the first time, but she could not leave her job with a dredge. So we lay there near the marshes, which were full of wild ducks and other birds making night hideous with their calls and squawks. We waited until 7:00 A.M. of June 3 before a steamer, named *Vision*, came upriver. After a short parley about "the danger" the captain of the *Vision* would run in pulling us off the Canadian shore on account of the laws against conducting "wrecking operations" on a "foreign coast," he pulled us off and we moved along upriver again, having been delayed nine hours since our pilot (?) ran us aground the first time. So we had our *first* experience in being wrecked — at a cost of $25 plus $2.00 and a nine-hour delay in our schedule. (The $27 were deducted from the pilot's salary.)

These vicissitudes passed, we reached Port Huron at the entrance to Lake Huron about one o'clock and lay there for about 10 minutes while a terrific wind squall and thundershower passed over. The fog slowed us up on Lake Huron, and we lay at the pier in the "Harbor of Refuge" during the night, being joined there by the *Vision*.

On Sunday, June 4, with the *Vision* as our consort, we had a pleasant run over Lake Huron, passing through the Straits of Mackinac at night. We came into Lake Michigan at three o'clock on the morning of June 5. That afternoon a domino tournament was held. Mr. Wiard won the championship belt, and Mr. Dyer the second prize, a bottle of jam.

Coaling up at Milwaukee on the morning of June 6, we were off Chicago Light at seven in the evening and came alongside the north pier at Jackson Park soon thereafter. The exposition grounds were illuminated that evening for the first time. The Technology delegation landed immediately upon arrival and headed for the electrical building. Sousa's band was playing. President Walker, Charles M. Sears, '92, William G. Snow, '88, and his wife were among those we met.

The officials of the exposition were particularly co-operative with the M.I.T. voyagers, permitting the *Cadet* to lie at the north pier for her entire stay of 10 days. It is unnecessary to detail our activities during those days. Needless to say we did all the things that fair-goers always do, and we had a good time doing them. At ten o'clock on the evening of Saturday, June 17, the *Cadet* steamed away on the return trip, which is well summarized from a story in *The Tech* on December 21, 1893, written by Andrew D. Fuller, one of our student passengers and Secretary of *The Tech:*

". . . During the eleven days' stay at Chicago, the party received many attentions and favors from the Exposition officials and others. A well-attended reception was tendered all Tech men, the 'Cadet' was gayly festooned with lanterns, refreshments were served, and a successful social evening was passed. After the brilliant display of fire-works on the evening of Massachusetts day, June 17th, the lines were cast off, and after a rattling Tech cheer the wonderful 'White City' faded into the darkness. The excellent weather, the sights of various ports, the domino, checker, shooting, and other tournaments, combined with gay spirits to shorten the lake trip; but all were glad to leave the boat at Lockport, N. Y., for a day at Niagara Falls. From Rochester, where the boat was again boarded, to Albany stretched the apparently unattractive canal; but the fine scenery, the proximity to the village people, gaping at the largest boat that ever went through the canal, — the novelty of the life, made this the most interesting part of the trip. Stops were made at New York, Newport, Cottage City, and Martha's Vineyard, before reaching Boston on June 29th. Considerable credit is due Mr. B. R. T. Collins for originating and managing the party. With no experience in such matters, few would have had the courage and perseverance to carry out the plan."

Thus ends the story of the *Cadet*. The total expenses of the trip, $3,027.95, were divided among the 23 passengers. I enjoy recollecting that the estimate of expenses which I had made in advance of the trip turned out to be 100 per cent correct — the best estimate of my subsequent engineering career of nearly half a century.

EXCEPT THE ROD

(*Concluded from page 315*)

shrink. The conventional test, which is to bounce a loaded (250 pounds) barrel from the top of a 10-foot truck into a concrete cellarway, may be a bit harsh, but the plywood construction has proved to be entirely adequate. Cylindrical plywood containers, or drums, constructed with metal-locked joints or scarfed plywood joints, or spirally wound and jointless, are extensively used for products for which metals are objectionable. Plywood shooks for all manner of cases are well known, especially for tea chests, export-shipment containers, and so on.

In the transportation field, plywood is an excellent insulator for refrigerator cars, and the resin adhesives have resulted in moistureproof plywood for such exacting uses. Plywood construction has proved to be sturdy for freight-car exteriors and interiors, results in a tighter car, and substantially reduces the man-hours needed for erection. Home trailers, the nomads of the roadway, are almost always plywood, whether boxlike or streamline. Combinations of plywood and metal find wide use in truck cabs, bus bodies, delivery vehicles, and streamline trains. Many auto body parts, such as floor boards, tonneaus, seat bases, and running boards, can be of plywood. A baggage rack of plywood and fiber construction, preformed in the bonding operation and perforated, is shown in Fig. 3.

Plywood serves many useful ends in factory equipment, such as in die-cutting maple blocks, in forming dies for thin sheet metals, in handles, and in various machine parts. When plywood is made with adjacent layers on 20-degree, 30-degree, or 45-degree angles, arranged clockwise around the circle and superpressed to high density, excellent blanks are provided for silent gears, with several qualities which surpass rawhide and vulcanized fiber. Foundry patterns with plywood webs are definitely superior to those of solid wood, which may shrink or swell in wet molding sand. High-density plywood can often be used in textile machinery and other products for which such hardwoods as lignum vitae, ebony, and ironwood were formerly considered essential.

For relaxation and recuperation in these strenuous and perplexing times, sport equipment is becoming even more important than usual. The better grades of tennis and badminton rackets are now made of curved veneer, glued into laminated constructions closely resembling plywood. Such a racket, before and after finishing, is shown in Fig. 4. Ski and toboggans are preferably made of plywood, preformed with adhesives in the gluing operation; in strength, stability, and resiliency they show considerable improvement over those of solid bentwood. High-density plywood is under investigation for roller-skate wheels, for which use it offers better all-round qualities than does metal, solid wood, rubber, or fiber. Plywood is the recognized standard construction for ping-pong tables and bats. Laminated gunstocks, with resin adhesives, offer greater strength and availability than does solid wood but are not likely to find extensive use until solid blanks become more difficult to obtain. The builders of many types of light watercraft, rowboats, dinghies, canoes, racing shells, and small powerboats find that plywood, now that it is thoroughly waterproof when hot-bonded with phenolic resin adhesives, makes a sturdier and lighter craft than can be produced from any other reasonably priced materials. Plywood surfaces, however, should be well safeguarded by paints and other protective coatings, as is customarily done with solid wood.

Still other uses for plywood are auditorium seats; the consistent curvature of the material adds to human comfort, and plywood provides commendable cleanliness in public places, as contrasted with upholstered seats. Traveling bags and suitcases, if of plywood, have a strength-to-weight ratio more favorable than when they are made from other available materials. Moreover, the decorative value of plywood is emphasized in new types of lightweight hand baggage, comparable to some furniture in its attractiveness. Rubber-covered plywood toilet seats are standard in all Pullman cars. Serving trays of well-known types are preformed plywood and have been turned out by the hundreds of thousands. Even burial caskets may yield to the obvious advantages of plywood.

The enumeration could go on and on, but enough has been outlined to show the multitude of ways in which plywood and its derivatives are becoming essential in all fields of human endeavor. Few easily available materials of such remarkable versatility afford so wide a range of practical adaptations — for the artist, who strives to please the eye; for the engineer, who demands strength, economy, and safety; as well as for the woodworker, who requires moderate-priced and lightweight sheets of wood which will not split, shrink, or swell and can be made in all kinds of flat and curved shapes.

ANSWER, ECHO, ANSWER

(*Continued from page 312*)

gear from its path. Captain Peacock's men get onto a shoal, and find, let us say, that the least depth by echo sounder is 17 feet. But, as I have said, there are spaces between those furrows of the echo soundings. Something may be poking up there. So the draggers set the drag at 16 feet. If it hangs up, then they know they haven't yet got the least depth. They feel around with the hand lead, and find 15 feet. Then they set the drag at 14 feet, and try again. If it goes clear, the job is done. The shoal is established at a safe minimum of 14 feet.

But the *Oceanographer* surveys not only harbors; she goes out beyond the 1,000-fathom curve, as far as seventy miles offshore. Last season, in the Gulf of Maine, between April and November, she surveyed an area of 8,000 square miles, an area almost as large as Massachusetts. This indicates what modern sounding gear can do.

"The ship ran a 90-mile traverse off Cape Ann and then connected in off the Isles of Shoals," Captain Peacock said. "The cruise started with a nice regular figure, but irregular bottom developed and we couldn't bomb through."

That phrase "bomb through" brings up another use for echoes. To carry the scheme of marine triangulation offshore, out of sight of land, which can't possibly be

(*Continued on page 330*)

ANSWER, ECHO, ANSWER

(*Continued from page 328*)

done accurately by navigation, a system of buoy control for a given area is set up. Radiosonic buoys are planted and located accurately by a sea traverse measured by taut wire apparatus. The initial buoy's position is fixed by sextant angles measured between triangulation stations onshore. The ship then runs from that buoy to the next, paying out wire under tension, and reading the distance from the counter on the sheave in which the wire runs. For direction, the *Oceanographer* measures simultaneously a vertical angle between the sun and the horizon and an inclined angle between the sun and the two buoys when they are on range.

Having established the position of a certain number of these buoys, the *Oceanographer* will now know where she is at any time if she knows how she bears from these buoys and how far off from them she is. She is moving away to sea and has her navigational line, but this is not accurate enough. Where in fact is she? Her echo-sounding apparatus at any given instant gives the depth of water under her, but just where is that depth?

The answer can be known accurately only with reference to radiosonic buoys whose position has been fixed. How far astern are they? The *Oceanographer* determines this by another use of echo, a horizontal instead of a vertical use. She tosses over a small bomb of TNT, set to explode at a depth of 50 feet. That is, the bombing officer pushes a button for the size bomb he wants — they range from a quarter of a pint to a quart — and then, after a minute interval, gives the bomber aft his firing signal. The bomb goes overboard and explodes.

In the radio room is a chronograph which feeds out a seagoing tape measure. The points of two little arms, or styluses, rest on this tape measure. One of these arms is connected to a break-circuit chronometer which marks second intervals of time on the tape. The other arm marks the time of the bomb explosions on the opposite side of the middle line of the tape.

The bomb explodes, and the noise travels under water to the buoys, because it goes out equally in all directions from the origin, at the rate of about 5,000 feet a second. In the head of each buoy is a little radio transmitting station, and in the lower compartment is a small power plant of dry cells. This transmitting station throws the noise back to the ship, and the stylus which recorded the original noise of the explosion now marks the receipt of the return signal from each of the buoys.

All that has to be done now is to scale off on the tape the elapsed time between the explosion and its return from each buoy, and to convert this time into distance. There are minor corrections for differing saltness of water and differing temperatures, but the hardest things are as easy as the easiest if you know how to allow for them. Only a shoal can interfere with the sound of the bomb. That was what Captain Peacock meant when he said he couldn't "bomb through" — too many shoals.

It used to take over an hour for a sounding vessel to sound in 20,000 feet; now it can be done in eight seconds. Offshore soundings may yet be extended to the ocean's very deepest depths, and those depths are deep. Actually the sea is deeper than the land is high. As so far sounded, the deepest hole, off Mindanao in the Pacific, is 35,400 feet deep, and that is deeper by some 6,000 feet than Mount Everest is high.

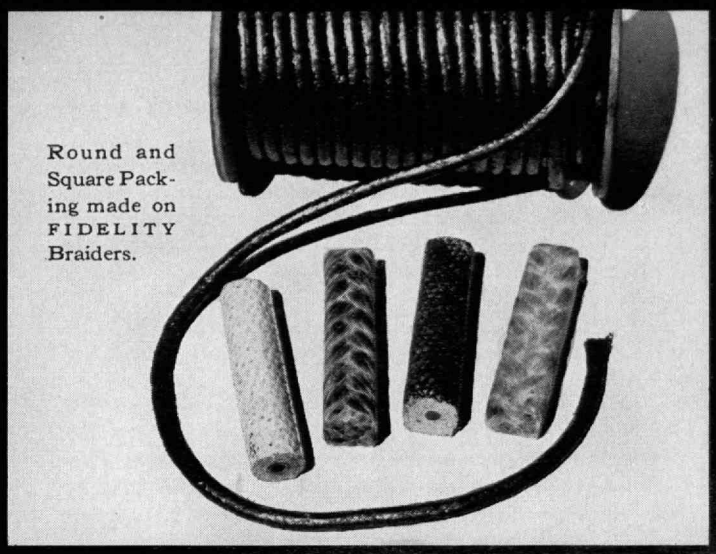
Gilbert T. Rude, a captain of the United States Coast and Geodetic Survey, said humorously that before long the very lineaments of Plato's lost Atlantis may be brought to light by modern sounding methods. The gist of Plato's tale is that there once existed in the Atlantic Ocean, opposite the mouth of the Mediterranean Sea — the Pillars of Hercules, as the ancients called that mouth — the great island or continent of Atlantis. According to the tale, Atlantis was the region where man first rose out of barbarism and became civilized. Plato pictured this island as the happy land, somewhat like the Greek Elysian fields or the Babylonian Garden of Eden — of which Plato had never heard — a great land where early mankind dwelt for ages in peace and happiness. The island was ruled over by the god Poseidon. Plato describes the magnificence of his temple, with its walls of silver and its pinnacles of gold, and a statue of the golden god himself standing in a chariot and reining in six winged horses.

For many generations, as long as the divine nature lasted in them, the people of Atlantis were obedient to the laws and well spoken toward the gods who were their kinsmen, says Plato. For they possessed true and, in every way, great spirits, showing gentleness and wisdom in the various practices of life, and giving little thought to the possession of gold and other property, which seemed only a burden to them. Neither were they intoxicated by luxury, nor did wealth deprive them of their self-control, but they were sober, and saw clearly that all these goods are increased by virtuous friendship with one another, and that by excessive zeal for gold, the good of it is lost and friendship too perishes.

But when this divine portion began to fade away in them, as Plato tells the story, and human nature got the upper hand, then they became greedy and warlike, and carried fire and sword to the adjacent continent. This great and wonderful empire of Atlantis made war wantonly against the whole of Europe and Asia, and not only subjugated Africa as far as Egypt, and Europe as far as Italy, but also ruled over the "opposite continent" — though of course this imaginative reference does not imply that Plato had any inkling of America.

But then at the height of its iniquity, when Atlantis had subjugated parts of Libya within the columns of Hercules, as far as Egypt, and parts of Europe as far as Tyrrhenia (practically matching Hitler's moves), suddenly it was destroyed as if by Jove's thunderbolt. In a single day and night, there occurred violent earthquakes and floods; the silver and gold temple reeled and fell; the horses of Poseidon were shattered; the revels of the conqueror were interrupted, and the cup fell from his lips. He and all his generation were lost forever; and in a single day and night all those warlike men sank in a body and so too disappeared the island of Atlantis. And that, says Plato, is the reason why the sea in those parts is impossible and impenetrable. There is so much shallow mud there, caused by the subsidence of Atlantis.

(*Concluded on page 332*)



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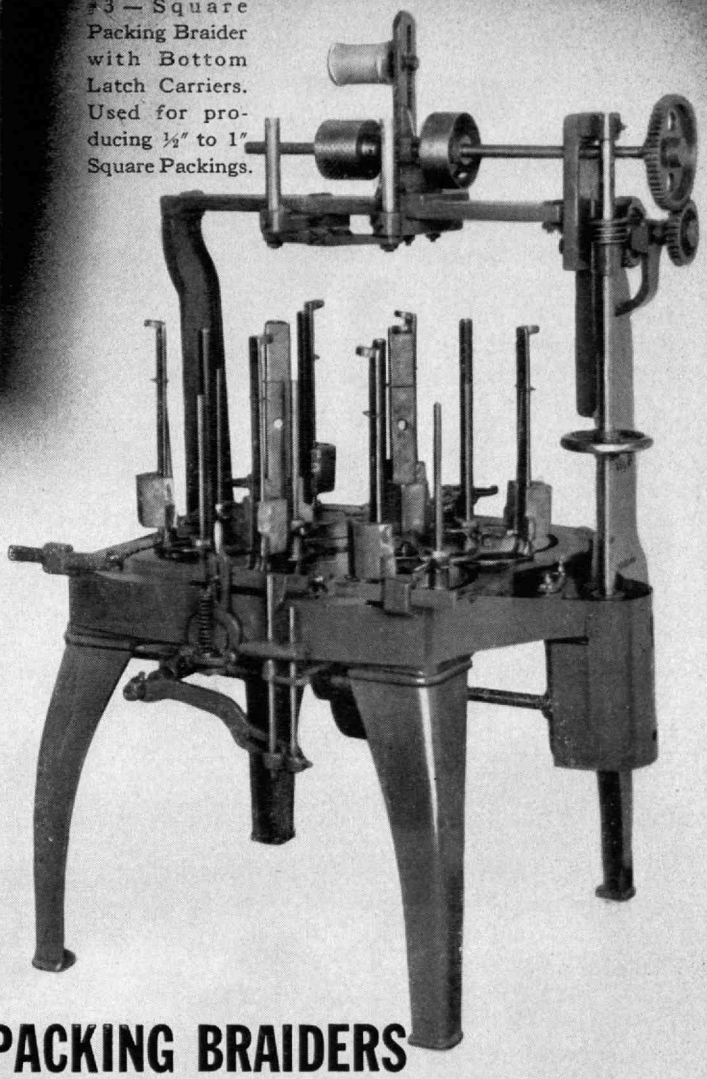

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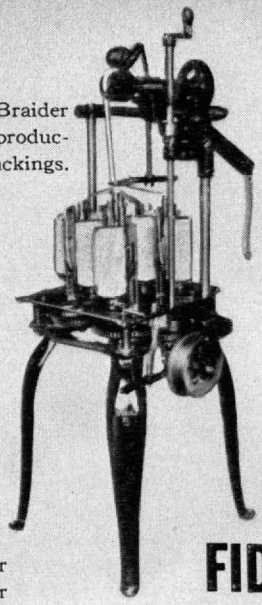
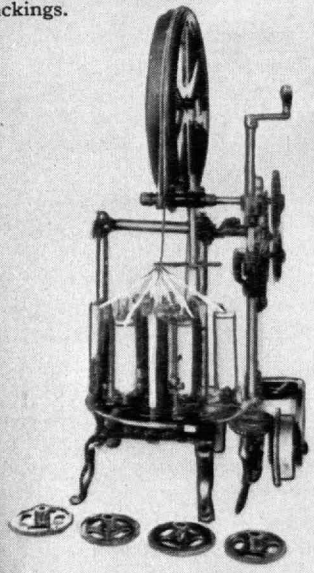


#0 — Square Packing Braider with Spring Carriers. Used for producing ⅛"—5/16"—¼" Square Packings.



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ANSWER, ECHO, ANSWER

(*Concluded from page 330*)

So for thousands of years the ancients believed the Atlantic Ocean to be a muddy, shallow, dark, and treacherous sea. They called it *Mare Tenebrosum*, the Sea of Shadows. Nobody would venture forth on it, and so for a time the Western Hemisphere was safe.

Now all this is poetry, and very good poetry too. In Plato's story we read a parable addressed to his fellow Greeks — not only urging them to clean living and to fair dealings, but picturing in a noble and symbolic figure of speech the superiority of Greek ideals, Greek thought, and Greek art to all that the world then knew. The hordes of Atlantis might ravage the rest of the world, even Egypt might fall, but there would always be a Greece.

In a sense, Plato was a major prophet. For Greek art and letters were to light the ages far beyond his time. But we do not look for any solid rock of fact behind the noble legend of a continent beneath the sea. The oceanographers of the Coast and Geodetic Survey are not going to define that "lost continent," as they have lately defined the continental shelf. They have better work afoot in rousing into clarity the submarine ridge along the center of the Atlantic floor and in mapping the volcanoes of the ocean.

Ought we even to wish the lost Atlantis back? The modern world had the lesson, and could not profit by it. The legend of Atlantis is the merest echo from ". . . the dark backward and abysm of time." But if by some miracle that drowned shape ever should be traced, an echo will do it — the echo of the *Oceanographer*'s Fathometer.

A CLOTH OF GLASS

(*Continued from page 318*)

plan and erect a new building, or enlarge the blacksmith's shop for the purpose of containing it. For this cause, we shall have to erect another blacksmith's shop in some other part of the yard.

May, 1865: . . . Preparations for opening our Works have gone along, our men have been engaged in England and America, and during the present week we hope to make some glass.

Our English potmaker, Mr. Robert Squires, broke his leg a short time ago, by slipping on a light of rough plate glass in our inclined passageway. Fortunately the potrun was well supplied, and no detriment occurred in the process of our work, although we pity the fat and somewhat fussy man who is now confined at home by the accident.

Fire was put into the pot arches on May 18th, into the melting furnace on May 20th, and on May 27th, I saw the fire heating up the furnace, and on Monday, I saw the first pot set. . . .

Mr. Neale said everything was going on right, but one pot being slightly cracked, which he hoped to use half full of metal.

June 5, 1865: I was present at the second blowing at our Works this morning. The first took place on Friday morning, June 2. The glass was not good and we did not expect good results at first.

June 12, 1865: We had several melts last week and another blowing commenced at noon today. We have had several pots broken and poor stony and knotty glass. But we look for better results yet.

June 17, 1865: The men blowed today, but the weather was so hot that they had to desist, and to dip out the metal.

June 19, 1865: Mr. Neale wrote to us that he had melted in nine hours, and blown some very good glass, for a few hours this morning, when the glass became ambitty (a state of incipient devitrification).

June 20, 1865: Today, in the afternoon, we had the same experience as on yesterday in regard to ambitty glass. We have had some trouble with men striking for higher wages, some being gatherers and some flatteners. We have managed to get along by turning away some of the ringleaders and giving the best terms possible to those who remained.

We have not yet accomplished our object in making good glass in a large quantity and at a low rate of cost. In a few weeks or days, I hope to record better results.

In all undertakings of any importance, it is an old and established maxim, that "it is the first step which costs." We have not found glassmaking any exception to the rule.

June 28, 1865: Mr. Neale had a blowing last Tuesday night, in which he made some most beautiful glass.

July 8, 1865: We have made some good and some poor glass since the above record, but we have not been able as yet to "blow out" the metal in a furnace full of pots, and so we have not filled all our pots.

Of course, in this way, we cannot make glass except at a great loss. We have had hot weather, some broken pots, some poor workmen, some trouble with the men who have been offered too high wages by the Saxon Sheet Glass Co., and have obliged us to pay too much also, and other troubles such as attend all new manufacturing enterprises at their commencement.

We have not yet made any estimate of the cost of our glass, but I know that it must be far beyond its worth.

July 25, 1865: We have been making some very good glass since the above record, and the general quality has improved, and some improvements have been effected in some departments of our Factory, but we have had all our hopes dashed at this moment by the foul demon of intemperance. The men, especially the Englishmen, have given Mr. Neale a great deal of trouble by drunkenness, but on last evening, the evil was so increased that only four men were able to blow and three to gather. We have 14 blowers and 14 gatherers when our complement is full.

Of course only a portion of the metal could be blown out. The balance will be reheated and blown out tomorrow. The metal was very pure, and it seemed cruel to be placed in such a dilemma. The decent and temperate workmen and Mr. Neale feel much mortified and chagrined. But we can do nothing now but block the furnace and stop our work until a new set of good and temperate men can be obtained from England.

July 27, 1865: [Mr. Neale] has blocked the furnace. . . . He will . . . go to England . . . and endeavour, if possible, to obtain some good men, with whom he has no doubt he will achieve success. He has made some excellent glass, and he only needs good men to make the manufacture, in his opinion, a successful and profitable work.

We have spent the whole day in discussing the present condition and future prospects of our Works, and have come to the decision to make one more trial. If it shall succeed, we shall be repaid for our five years of labor, anxiety and expenditure. If it do not succeed, we shall have the satisfaction of having made an honest attempt to advance the prosperity of our city by introducing a new brand of manufacture.

April, 1866: It is only within a short time that we have settled up our business for the last year. The Factory will occasion us a loss of $50,000 or more from loss of pots, loss of melts, intemperance of men, and a thousand other losses and greater difficulties of manufacture. . . .

(*Continued on page 334*)

MAN OF WAR

PETE is a quiet, peace-loving man. Treats his family fine and pays his bills and gets along with his neighbors. Hasn't struck a blow in anger since he was a kid and caught another boy mistreating a dog.

But today Pete is mad clear through. You'd never guess it to see him at home; if anything he's quieter than ever. He isn't the kind to go around gritting his teeth and calling names.

When you see him at work, though—then's when you realize the difference. For there's a deadly precision in the way he goes about his work. He's on the job a little before starting time; he pays more careful attention to what he's doing; he knows what he's building and for whom he's building it. And that's why he's probably the most dangerous, the "fightingest" enemy the Axis powers have.

For it's men like Pete—who feel the way he feels, who are doing what he is doing—who are manning the machines in America's factories today. And they're turning out the deadliest, most effective array of weapons the world has ever seen.

There are a lot of men like Pete among the 125,000 General Electric employees these days. In their off hours you'll find them acting as air-raid wardens in their communities. You'll find them among the more than 100,000 G-E men and women who, without any fanfare or hurrah-boys, have signed up for U.S. Defense Savings Bonds to the tune of more than $20,000,000 a year. But most important of all, you'll find them on their job—doing what they know best and giving it the best they've got.

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A CLOTH OF GLASS

(*Continued from page 332*)

If I could have seen the difficulties from the beginning which I have encountered, I should have hesitated long, if I had not wholly abandoned the idea of manufacturing glass. I should have been worth more money to have adhered to my business of importing glass. But I have had the pleasure of investigating the subject of glassmaking, the pleasure of studying at the Scientific School, and of going to Europe in 1862. These studies and joys I would not exchange for money. I live in hopes that we may yet make a good article of glass and obtain some repayment for our trouble. But if not, I shall be glad to return to the exclusive business of importing, and allow someone else to enjoy the pleasures of manufacturing.

Although men were brought over from England, a third attempt was never made. Gaffield sold his interest to his partner, Mr. Tuttle, for $95,000. The original cost was $186,000. About 1880, Tuttle finally sold the whole property for $60,000, a loss of $126,000. This constituted the deficit on the property only and is in addition to the loss in one year of the $50,000 mentioned above, which was occasioned by the second attempt to manufacture glass. These sums indicate how much capital was needed to run a glass factory for merely a couple of years. The following figures contrast sharply with the enticing estimates of annual profit previously quoted. Gaffield says:

We paid out in 1865 and 1866 for materials and wages		$269,616.00
We received glass manufactured, valued at somewhat above the cost of importing Belgian of the same sizes	$119,927	
We have stock on hand at the factory	26,000	145,927.00
Making a loss of		$123,689.00

If we estimate that as much was lost in Gaffield and Tuttle's first attempt as in the second, and add the property loss, we find that some $375,000 was dissipated in the smoke from the chimneys of this one factory — all within a short five years. The stove on which Tuttle and Gaffield were badly scorched still had one live ember left in the form of a suit by Mr. Neale, their manager, for his salary of $4,000 a year for the two remaining years of his contract. Gaffield had not foreseen that the works might close down before Neale's contract had expired. After a good deal of acrimonious correspondence and several hearings which were held before Henry W. Paine, Neale was awarded the sum of $5,750 in settlement.

The story of the Boston Crystal Glass Works was not unusual. Gaffield records instance after instance of new factories being started only to fail — the shortest case on record being that of the American Glass Company, which ran for a whole three weeks. Two men, Mr. Davis and Mr. Gray, were particularly assiduous, about 1864, in persuading weak-minded gentlemen to part with their cash. Together with a Mr. Tipper, they were responsible for the American Glass Company's fiasco, in which a trio of R's — Messrs. Reynolds, Roberts, and Rand — were relieved of a considerable portion of their surplus capital, Gaffield adding that "such is the mendacity, miscalculation or exaggeration of glass blowers and workmen frequently, when they have nothing to lose themselves."

Or take the Saxon Sheet Glass Company, started in the spring of 1865 by "some South Boston men, who are carried away with the idea that a great deal of money can be made in the business of manufacturing glass. They have probably been deluded by the large stories of the glass workmen who have induced them to invest their capital in the enterprise. Among these workmen were Mr. Gray and Mr. Davis." The Saxon venture failed in six months to the tune of $36,000 — a figure which probably does not include property losses. Mr. Davis tried a second time and persuaded Simon Bache and Company, glass dealers in New York City, to invest a sufficient amount to reopen the Saxon factory. In six more months, the first failure was repeated. Gaffield, referring to the Saxon Sheet Glass Company, sums up most succinctly the situation for makers of building glass: "The Works are poor in many details, the workmen were poor, and the glass made was poor. Window glassmakers have a poor chance of success or money making in our country."

Though the fact is difficult of belief, the Saxon works opened a third time, under Messrs. Nickerson and Robinson, ran a few weeks, and then closed with a deficit of $32,000. Mr. Davis, who in persuading men to part with their money was as persistent and successful as an old maid who insists on monopolizing the conversation at dinner, evidently felt he had wrung Boston dry, and moved on to greener fields, being last heard from in Montreal.

In this second era of glass expansion in Massachusetts, causes for failure were many — uncertain times, both in labor and in market conditions, as a result of the war; insufficient knowledge of the business; too great optimism in regard to expected profits on the basis of estimates provided; and, finally, trouble with workmen, both with incompetent managers and also with recalcitrant and slovenly laborers. To these difficulties can be added that of fire, resulting in great part from inefficient and uninterested workmen. Newspapers of the period as well as Gaffield record the destruction by fire of factory after factory, especially those hastily constructed of wood.

The disintegration even of companies which may be said to have succeeded was hastened by the same causes, coupled with a more nearly fundamental reason than any of the others — the increasing westward expansion of the glass industry. Indeed, the fact that some companies were able to stay solvent as long as they did is much to their credit. For instance, the Massachusetts Glass Company, located in Cheshire, ran from 1849 to 1870. "But bad management, and ignorance, and inexperience led to the usual result." Another, the Cheshire Glass Company, had ups and downs throughout a period of some years. It "was first opened as a Cylinder Glass Works in 1851 [a previous Cheshire glass factory, of which there is no record, had existed] and then changed into a Rough Plate Works, and again into a Cylinder Works, and did not prove a success."

The Lenox Glass Company was another more or less successful establishment — running for 22 years, from

1853 to 1875. It failed as a cylinder works, twice more as a rough-plate works, but finally succeeded under the management of a Mr. Phelps. It was burned down twice, in 1862 and again in 1863, but was rebuilt. When George Neale, formerly with the Boston Crystal Glass Works, became manager, the now familiar pattern of events emerged. He insisted on using Stourbridge clay instead of the German clay which had proved successful, and he swung off into the manufacture of sheet, bottle, and cryolite glass as well as plate glass. "My impression from what I hear is that the company would have dispensed with Mr. Neale's services, if he had not voluntarily resigned. He sometimes imbibed too deeply, I am told." In 1875 all papers carried a notice of the impending sale of the Lenox Glass Company by the mortgagee, Theodore Roosevelt.

One more company, the Berkshire Glass Company, must be mentioned. Over a period of 26 years, from 1853 to 1879, it produced much fine glass. Yet its record, too, is one of variation. Its first attempt, under the direction of Messrs. Fox, Richmond, Crandall, and Whipple, was a failure. It was taken over by Page and Robbins — later Page and Harding — who stayed with it until the end. In the matter of workmen, however, Gaffield has this to say: "The Englishmen who have gone to Berkshire and Winslow have caused the manufacturers a great deal of trouble. They have had their passage money paid, and after arrival some have become intemperate, discontented, spent their wages, run in debt, left their employers, gone to other Factories, and some returned to England."

The reason for the comparatively greater success of these four western Massachusetts companies over those of Boston and vicinity was that the only two places in New England with sand suitable for the manufacture of glass were Cheshire and Lanesboro in the Berkshires. Among other displays connected with the process of glass manufacture, the Technology Museum has an exhibit of Berkshire sand, which is very fine and nearly pure white.

Hence the Massachusetts, Cheshire, Lenox, and Berkshire companies were located near enough to an adequate and acceptable source of supply to compete with Pennsylvania, West Virginia, Ohio, and Indiana factories, which were rapidly being established near newly discovered sand deposits in those states and also close to a source of fuel, coal. Eastern Massachusetts companies, on the other hand, had to import their sand and their fuel, the added cost necessarily entailing higher prices for their ware. This divergence in price is clearly shown by Gaffield in a conversation in 1873 with Mr. Briggs, a director of the New England Glass Company: "Mr. Briggs said it was useless to endeavor to compete with the cheap coal and labor at the Pittsburgh Glass Works, and that Pittsburgh wine glasses offered him at 75 cents per dozen could not be made for less than $1.25 at Cambridge."

The century of glass manufacture in Massachusetts was by then nearing its end, the causes for the final collapse of the industry being deeper than labor troubles, fires, and false optimism. The dates of the closing of the two main companies which had been manufacturing

(*Concluded on page 336*)

A CLOTH OF GLASS

(*Concluded from page 335*)

glassware for more than half a century, the New England Glass Company in 1877 and the Boston and Sandwich Glass Company in 1878, correspond very closely to those of three of the four most successful companies manufacturing building glass during the second era — the Massachusetts Glass Company in 1870, the Lenox Glass Company in 1875, and the Berkshire Glass Company in 1879. Westward migration, discovery of new deposits of materials in the Middle West, and cheaper labor conditions in that section were the major factors wearing out the cloth of this particular industrial pattern.

When all is said and done, the efforts of Massachusetts to manufacture glass were not negligible. It is a record which shows initiative, enterprise, and, on the part of a few companies, accomplishment. Managers and owners of the successful companies cannot be entirely blamed for their failures. They were forced into experiments in an effort to compete with the glass factories of the Middle West, which had ample materials close at hand. They were caught in a vise of impossibilities. On the one hand, they could not meet the prices of the Pennsylvania, West Virginia, Ohio, and Indiana companies if they had to pay for importing materials. On the other, they could not produce good glass if they used native supplies. The jaws of this vise closed inexorably.

In his article on glass in the census of 1900, Shirley P. Austin reports: "The Atlantic seaboard long held supremacy in the manufacture of glass, but with the westward spread of population and the discovery of rich fuel resources in western Pennsylvania, West Virginia, Ohio, and Indiana, the center of the industry has steadily moved westward . . ."

As this inquiry into the century of glass manufacture in Massachusetts has indicated, Mr. Austin's conclusions leave nothing more to be said.

DETECTION DEEP DOWN

(*Continued from page 321*)

professors who are members of this committee are Percy W. Bridgman, famous for his classic experiments on the behavior of materials under high pressures, and Reginald A. Daly, formerly on the Technology Faculty, who is one of the world's leading authorities on dynamic and experimental geology. Such sponsorship effectively broke down the long-standing barrier between physics and geology and made possible a maximum of cooperation.

In an early series of experiments carried on under the aegis of the Harvard group, William A. Zisman, '27, found very poor correspondence between the wave velocities computed from some conventional elastic measurements he had made on small specimens of granite and norite formations and the seismic velocities obtained by Dr. Leet and W. M. Ewing from quarry blasts in the same formations. Attributing this difference to the fact that most rocks are too porous and inhomo-

(*Continued on page 338*)

DETECTION DEEP DOWN

(*Continued from page 336*)

geneous to act as true elastic solids, Zisman concluded that ordinary measurements of compressibility, Young's modulus, and so forth, would check with the results of seismic measurements only for compact surface rocks or other rocks buried at such great depths that all joints and interstices are closed.

Shortly after the publication of these rather discouraging conclusions, another member of the Harvard group, John M. Ide, decided that it should be possible to measure the elastic constants in such a way that the pores and interstices within a rock sample would not invalidate the comparison with the corresponding constants calculated from actual seismic speeds. He pointed out that in the testing laboratory the methods of determining the constants were static, involving no motion within the sample, whereas the seismic measurements were of a real wave motion, which was not affected in the same way by the porosity. The conclusion was that some dynamic method which involved the actual passage of elastic waves through a laboratory specimen would much more closely simulate the situation at depth when earthquake waves travel through rock layers. Dr. Ide developed a technique based on this conception which gave results in such good agreement with those of seismic field studies that nearly all of the subsequent work on the problem of identifying the crustal layers has been carried on along similar lines.

His technique was to stand his rock sample on end upon a thick steel disk with a mica sheet sandwiched between the two. A metal foil was cemented to the bottom surface of the specimen, and the output of a variable-frequency oscillator was connected across the mica condenser thus formed. The procedure was to vary the frequency until a standing wave pattern was set up in the sample. At this point the rod would begin to resonate audibly; from the resonance frequency and length, the velocity of longitudinal waves in the rock material could be readily calculated, as could Young's modulus. Dr. Ide later devised similar apparatus for determining such others of the elastic constants as the rigidity modulus and Poisson's ratio. To test the consistency of his own dynamic methods as well as the static ones previously in use, he made a comparison between the velocities determined from four types of laboratory computations on certain samples and the velocities observed from the quarry-blast recordings of Leet and Ewing on corresponding formations existing at shallow depths. Although the dynamic methods gave the best check between the laboratory and the field, a considerable deviation was still found between observed and indirectly measured speeds for the less compact rocks, such as granite, marble, and gneiss. Fine-grained samples, like diabase and norite, gave excellent agreement when these methods were used, and Dr. Ide suspected that many other kinds of rock would also be in accord if subjected to pressures and temperatures that corresponded to the depths of the layers to be identified.

This phase of the work is being done with significant promise of success by Francis Birch, assistant professor

of geophysics, and his assistants, who are using high-pressure apparatus originally developed by Professor Bridgman. Dr. Birch had previously contributed to the geophysical program by making a series of interesting measurements on the compressibility of rocks and glasses at high pressures and temperatures; the results he obtained will be discussed shortly. In his experiments on the dynamic measurements of elastic constants under high pressures, he found that the quantity most accurately determinable under these conditions was the rigidity modulus, which could be calculated from the standing transverse, or shear, waves set up in a sample subjected to forced torsional oscillations. Longitudinal waves, he found, would set the liquid used as pressure medium into its own characteristic vibrations which would affect the resonance frequency of the sample undergoing test. Putting the apparatus in a high-pressure bomb, he and Dennison Bancroft, his assistant, were able to get curves of the rigidity and the corresponding shear-wave velocity as a function of pressure from atmospheric pressures up to 56,000 pounds per square inch (corresponding to a depth of 10 miles). Initially, these readings were taken at two temperatures, 30 degrees centigrade and 100 degrees centigrade, though subsequently for many samples they were extended to temperatures as high as 600 degrees centigrade, the same as that estimated for a depth of 20 miles. Rather recently he has increased the maximum pressure for this type of measurement to 10,000 kilograms per square centimeter (140,000 pounds per square inch), which corresponds to a somewhat greater depth. Always the speed of seismic waves was found to increase with added pressure — quite rapidly upon the application of the first 200 atmospheres and at a slower but approximately constant rate over the rest of the pressure range. This behavior was explained by the assumption that a certain initial pressure was required to close the cracks and joints before a rock would begin acting like a true elastic solid.

Fortunately, just as this work was going on in Dr. Birch's laboratory, Dr. Leet was extending his seismic measurements of New England quarry blasts up to shot-detector distances of 120 miles. In this way he was able to get actual timed arrivals of waves that not only penetrated the uppermost crustal layer but also traveled along the surface of the next layer below. On the basis of his laboratory measurements Dr. Birch calculated how the velocity of waves in granite would vary with depth at various pressures, and then he compared the times to be expected if the upper layer were all granite with the times observed by Dr. Leet. The agreement was so close that Dr. Birch was able to infer with confidence that the material of the uppermost crustal layer is granite and that this layer extends to a depth of nine miles.

Among the most important contributions that have been made by Dr. Birch and his associates at Harvard have been measurements of the effect of temperature upon the elastic constants. These measurements are particularly notable because they have been made at high pressures and thus give a reliable indication of how the same material would behave under the com-

(*Continued on page 340*)

DETECTION DEEP DOWN

(*Continued from page 339*)

bined effect of the pressures and temperatures existing at depth. Dr. Birch's earlier experiments determined the effect of temperature upon the compressibility of numerous samples of rocks and glasses heated up to 500 degrees centigrade and in some instances to higher temperatures. Nitrogen was used as the pressure medium in his apparatus, which consisted of a high-pressure bomb enclosed in an electric furnace. For ordinary crystalline rocks, the compressibility was found to increase with higher temperature, indicating a decrease in the velocity of seismic waves. But for glasses, the compressibility exhibited anomalous behavior, increasing with temperature at first, then decreasing, and finally increasing again as the temperature was raised still higher.

These measurements on the elastic properties of glasses were of especial interest to those concerned with our original problem of identifying the crustal layers, since there is reason to suspect that some of these layers may consist of materials in a vitreous, rather than a crystalline, phase. Any vitreous, or glassy, substance is essentially an undercooled liquid, having the same spatial relation between its constituent atoms that a liquid has. The principal difference is that in the vitreous material the atoms are "frozen" in their tracks and do not continually change their configuration as do those in a liquid. Several well-known igneous rocks, such as obsidian, are really glasses, inasmuch as their molecular structure indicates a random orientation of the atoms rather than the regular, predictable structure common to all crystalline rocks. Because it is so closely associated with the liquid state, any vitreous substance would conceivably show a marked change in mechanical properties upon being heated, and that is why the fact that seismic velocities in a glass depend upon temperature becomes an important consideration to the geophysicist.

When the more nearly valid and accurate dynamic methods of measuring the elastic constants were developed by Dr. Ide and Dr. Birch, the techniques were applied to high-temperature studies with further interesting results. Dr. Ide measured the Young's modulus of several rocks and glasses at temperatures up to 700

degrees centigrade, all at atmospheric pressures. His results confirmed those of the earlier compressibility measurements indicating that the velocity of sound increases with temperature in glasses, or vitreous rocks, and decreases in crystalline rocks. Dr. Birch has quite recently carried this work to the point where he has almost completely simulated the conditions down to the base of the uppermost layer, for he has measured the velocity of the transverse waves in several significant rocks under the combined pressures and temperatures to be expected at that depth range. By extrapolation of his figures, some good guesses can be made as to the situation at depths where considerably higher pressures and temperatures are met.

What diagnosis have the geophysical detectives reached in their efforts to match their complex laboratory "fingerprints" with the seismologists' indications of velocity for the earth's crust? The answers that can be given on the basis of the work thus far are tentative and uncertain. Moreover, they can seldom be unique, since the properties of more than one suspected rock material may fit the seismic predictions for a given layer. Further work, it is hoped, should do much toward increasing the reliability of the identifications.

For the uppermost layer in New England and the second layer in southern California, both with almost the same speeds, all evidence points to a granitic composition. The nature of the layer constituting the top eight miles in California is something of a mystery, since the velocity is presumably too low for granite. Dr. Birch suggests that this layer may consist of a combination of granite and lower-velocity sedimentary materials, since both kinds of rock are found at the surface in this area.

Below the granite, the evidence points to a material with composition intermediate between granite and basalt. This layer extends, everywhere except beneath the Pacific Ocean, from a depth of about nine miles to about 25 miles. Actually, it is probably not a single, homogeneous material, since there is indication of more than one velocity zone within the layer. Like the granitic layer, the second stratum consists of minerals rich in silicon and aluminum.

The layer below the seismic discontinuity at a depth of about 25 miles is presumed to be the bottom one for the earth's crust. The identification of it is difficult because the pressure and temperature at this level are so great that they both cannot be simulated in the labora-

(*Concluded on page 342*)

DETECTION DEEP DOWN

(*Concluded from page 341*)

tory at the same time. The high speed of 27,000 feet a second for longitudinal waves and 13,800 feet a second for transverse waves could be matched only by dunite (an olivine rock named for the Dun Mountains in New Zealand) when the early compressibility measurements were made under ordinary temperatures at the Carnegie Institution, and for some time this was presumed to be the material at the base of the crust. Later work by Dr. Birch indicated, however, that at the temperature and pressure to be expected at 25 miles, seismic waves would travel much too slowly in dunite. He concluded that if the material at this depth is a silicate, as is believed from other geologic evidence, the only possible constituent would be a garnet-rich material. Professor Daly interprets the facts of field geology to indicate a predominantly basaltic material for this bottom layer, one abundant in silicon and magnesium.

The present laboratory measurements do not permit the geophysicists to hazard more than a guess concerning the stratum below the bottom crustal layer. The geologists, however, infer that this material is of vitreous basaltic composition. Further laboratory work, especially on glasses at higher pressures and temperatures than are now employed in combination, should yield valuable information. There is every reason to believe that this goal will be accomplished with time.

In such an extension of the geophysicist's "mental penetration" into the earth and in the filling of the gaps and uncertainties in the present picture, we can expect laboratory work to play an increasing part. It is an indispensable tool for the uncovering of clues in a masterpiece of detective work that need not end, at least in imagination, until this penetration has reached the very center of the terrestrial sphere.

THE TREND OF AFFAIRS

(*Concluded from page 310*)

is being held to tolerances of a thousandth of an inch per foot by use of the phototemplates; as much as 250 hours of checking time is reported to have been eliminated in the production of a set of templates made from one drawing. ¶ Curtailment of tea supplies has revived interest in maté, which some ten millions south of the equator use regularly for the cup which cheers but does not inebriate. Though its other name, Paraguay tea — which originates through its having apparently first been used by the indigenous Guarani Indians of what is now the republic of Paraguay — does not suggest as much, chief production of the herb is in Brazil. Actual cultivation has not progressed to any great extent, most of the leaves being gathered by roving collectors from wild sources. Brazil consumes about 40,000,000 pounds a year; Argentina, 200,000,000. Occasional advertising efforts in the past have served to introduce maté in the United States but have not vigorously promoted the use of it. Expectation is that more consistent efforts to this end will be forthcoming.

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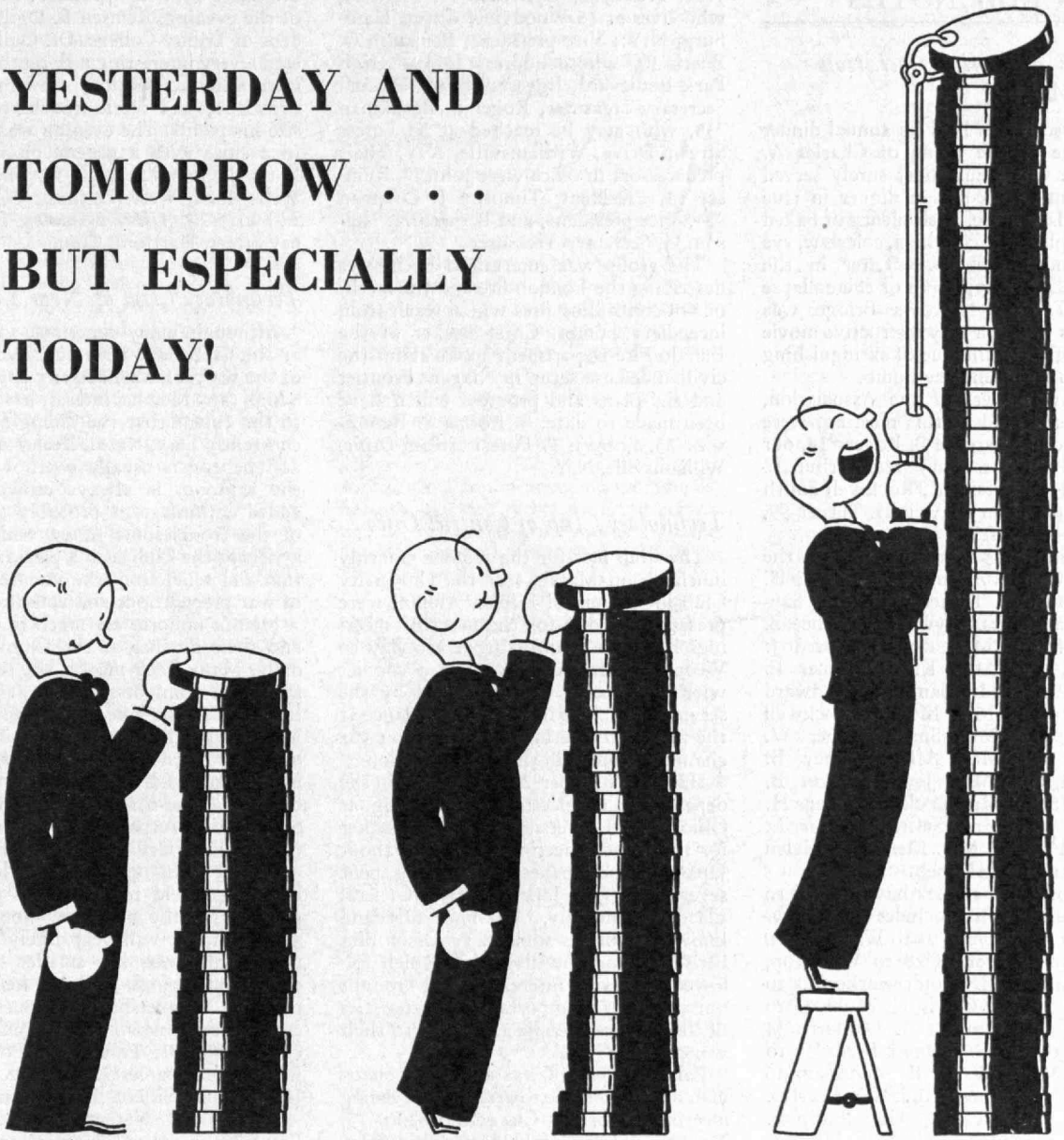

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Yesterday has gone. Tomorrow is always just ahead. But Today is here!

The first two years of the Alumni Fund belong to Yesterday. Their results are entered indelibly upon the record: 1940–1941, 7,867 contributors, $64,287.65; 1941–1942, 7,964 contributors, $77,851.85. Tomorrow's goal is clear: 10,000 contributors, $150,000. But it is Today's action which is needed to reach that goal.

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NEWS FROM THE CLUBS AND CLASSES

CLUB NOTES

Atlanta Alumni Association of the M.I.T.

The Association held its annual dinner and dance at the home of Charles A. Smith '99. Our genial host surely served the informal baked bean dinner in true New England style, with plenty of baked beans, applesauce, cold ham, coleslaw, rye bread, and apple pie. — Later in the evening a moving picture of the collapse of the Tacoma Narrows Bridge was shown, as well as a very instructive movie explaining the technique of extinguishing a magnesium incendiary bomb.

The new officers of the Association, who were elected at this meeting, were announced by Clarence B. Rogers '14, our retiring President. They are Arthur L. Merrifield '35, President; Rockwell Smith '26, Vice-president; Lawrie H. Turner '99, Secretary-Treasurer.

The following were present at the meeting: Charles A. Smith '99, Lawrie H. Turner and Mrs. Turner, William J. Sayward '01 and Mrs. Sayward, Clarence B. Rogers '14 and Mrs. Rogers, Alfred J. Kroog '22 and Mrs. Kroog, Elmer E. Sanborn '22 and Mrs. Sanborn, T. Edward Moodie '24 and Mrs. Moodie, Rockwell Smith '26 and Mrs. Smith, Roger W. Allen '27 and Mrs. Allen, Sidney B. Jewett '28 and Mrs. Jewett, Leon B. Locklin '28 and Mrs. Locklin, George H. Smith '32 and Mrs. Smith, Arthur L. Merrifield '35 and Mrs. Merrifield, Helen Boykin, and Mabel Loeb.

Many of our members have moved to other cities. This list includes the following: Percy H. Thomas '93 to Washington, D.C.; John T. Metcalf '28 to Winthrop, Mass.; Carlton E. Vanderwarker '30 to New York, N.Y.; Calvin H. Mohr '33 to McHenry, Ill.; Gordon A. Danforth '34 to Chicago, Ill.; E. Bennett Beede '35 to Belmont, Mass.; Walter K. MacAdam '36 to Great Neck, Long Island, N.Y.; Earl D. Fraser '37 to Sylacauga, Ala.; Philip E. Sellers '38 to Ridgewood, N.J.; John A. Eaton '40 to Waltham, Mass.; William T. Putnam '40 to Sacramento, Calif.; and William N. Price '41 to Cambridge, Mass.

Newcomers who have joined us in Atlanta are William A. Liddell '16, John J. Donnelly '22, Henry B. Sayler '23, and Frank W. Smalley '24. — LAWRIE H. TURNER '99, *Secretary*, 625 Sherwood Road, Northeast, Atlanta, Ga.

M.I.T. Association of Buffalo

The Association held a dinner meeting at the University Club on Wednesday, February 25. Election of officers was the primary purpose of the meeting. The following men assumed office for the coming year: President, Lawrence H. Flett '18, who lives at 18 Woodview Court, Hamburg, N.Y.; Vice-president, Benjamin C. Buerk '30, whose address is 192 High Park Boulevard, Eggertsville, N.Y.; and Secretary-Treasurer, Roger S. Brookman '35, who may be reached at 37 Forest Stream Drive, Williamsville, N.Y. Their predecessors in office were John D. Rumsey '33, President; Timothy J. Coleman '34, Vice-president; and Bernard H. Nelson '35, Secretary-Treasurer.

The group was entertained by movies describing the London fire and the methods of controlling fires which result from incendiary bombs. Chief Becker of the Buffalo Fire Department spoke about the civilian defense setup in Niagara Frontier and the plans and progress which have been made to date. — ROGER S. BROOKMAN '35, *Secretary*, 37 Forest Stream Drive, Williamsville, N.Y.

Technology Club of Central Ohio

The Club met for the regular monthly luncheon on March 4 at the University Club in Columbus. Fifteen Alumni were present. The day for the monthly meetings has been changed from Monday to Wednesday in order to avoid a conflict with the weekly meetings held by the service clubs. The increased attendance at the past two meetings indicates that the change is a move in the right direction.

Harold W. Bibber '20, a professor in the department of electrical engineering at Ohio State University, was the speaker for the March meeting. He spoke about Japan and the Japanese, and having spent several years in Japan for the General Electric Company, he had firsthand knowledge of his subject. Professor Bibber's talk and the discussion which followed were very interesting and brought out a number of important characteristics of the Japanese people as applied to their war policies.

Earl Richards '18 was appointed chairman of a committee to arrange an evening meeting in April. — CHARLES J. WARD '15, *Secretary*, Bureau of Bridges, Ohio State Highway Department, Columbus, Ohio.

Technology Club of Hartford

The Club held its second dinner meeting of the season on March 4 in the dining hall of Trinity College in Hartford. In attendance at the meeting, which was presided over by Thomas D. Green '26, were 38 members and guests. Following an excellent dinner, President Green brought up a few items of business for consideration by the members. He announced that the Club had received an invitation to join the New Haven County Technology Club in a meeting in April. The meeting was turned over to Arthur F. Peaslee '14, who introduced the speaker of the evening, Remsen B. Ogilby, President of Trinity College. Dr. Ogilby delivered a very interesting talk on the current international situation, drawing on his experiences as a world traveler to emphasize his points. The evening was brought to a close with a general discussion. — LOUIS J. PROULX, JR., '36, *Secretary*, 31 Wells Road, West Hartford, Conn. JOHN A. SWIFT '27, *Assistant Secretary*, 155 Whitney Street, Hartford, Conn.

Technology Club of New York

Although many functions and events at the Club have been curtailed because of the war, informal activity continues at a high rate. Member interest has increased to the extent that the dining rooms are constantly busy, the all-Tech round table at luncheon is usually overflowing, and the taproom is always crowded. The added enthusiasm is probably the result of the troublesome times, which make a visit to the Club such a pleasant relaxation and relief from the intense pressure of war preparations and activities.

Men in uniform are much in evidence, and their number at the Club increases daily. Many Tech men in the service are making a point of stopping at the Club for a short visit when they pass through New York. They usually find some classmates or friends from the Institute to make their visits more interesting. Many of these out-of-town men have expressed considerable surprise and admiration at the excellent facilities of the clubhouse.

Several class dinners and luncheons have been held recently, and more are planned for the next few months. The annual dinner will very likely be postponed this year, but smaller class and course gatherings will be held in its place. — Membership continues to increase. Recent new members include Guy C. Peterson '01, Francis D. Porcher '19, Manuel Shampanier '22, Edwin S. Worden, Jr., '31, and William L. Abramowitz '35. — WILLIAM D. NEUBERG '17, *Secretary*, 24 East 39th Street, New York, N.Y. CONSTANTINE S. DADAKIS '34, Publicity Committee, 644 Riverside Drive, New York, N.Y.

Niagara Falls Technology Club

A meeting of the Club was held at the Niagara Club on February 16. In spite of the particularly inclement weather that evening, 20 members were present for a steak dinner and a timely program of entertainment.

The meeting was opened with the singing of our "Stein Song" and "Take Me Back to Tech." After dinner, Lauren B. Hitchcock '20, our President, read a letter from James R. Killian, Jr., '26, Executive

Assistant to President Compton, describing the Institute's present and probable future degree of involvement in and contribution to the war effort. The question of varsity football at Tech was discussed at some length. A unanimous vote was recorded opposing the recognition of football as a varsity sport at the Institute. — William H. Hope, Jr., '36 presented a comprehensive picture of present student activities and attitudes, gleaned from several recent issues of *The Tech*. William H. Roberts, Jr., '31 talked about articles in The Review and gave us a general summary of changes that have taken place at the Institute in recent years.

The speaker of the evening was F. Jerome Tone, Jr., general sales manager of the Carborundum Company and chairman of the Niagara Falls Civilian Defense Council. In introducing Mr. Tone, Dr. Hitchcock spoke briefly of the special position of the Falls as a primary military objective, ranking with Detroit and Pittsburgh in this respect, and he emphasized the personal responsibility of each and every technically trained man to the community. The defense council will call on all engineers in the area to take an active part in the defense activities of the community.

Mr. Tone said that at present the biggest problem in organizing civilian defense groups is to convince the people that we are truly at war and that their danger is real and immediate, not by any means academic. He cited the difficulties encountered by the police and fire commands, whose large initial enrollments dropped off sharply when it became apparent that a considerable amount of effort was going to be required in carrying out their training programs. After reviewing the background of the local defense council, which was started early in 1941, some time before any national organization existed, Mr. Tone sketched the council's present setup, which is patterned after organizations of the British, and told us something of its accomplishments to date. While these are well in front of most similar local defense efforts, he emphasized that the accomplishments were by no means enough and that great additional efforts would be needed before a reasonable degree of preparedness was achieved. Mr. Tone said that as technical men our job is to inform the lay populace of the need to get out and work in order to be prepared as far as possible for any eventuality.

Mr. Tone's talk was followed by two sound films — one, in color, on the performance of the Bell Airacobra pursuit airplane, and the other an Office of Civilian Defense black-and-white film on incendiary bombs and the methods of fighting them. These pictures were obtained with some difficulty by Dr. Hitchcock through his connection with the civilian defense council and were delivered to the Niagara Club in a police squad car with special military guard. Both movies were timely and entertaining. — JOHN P. HAMILTON '36, *Secretary*, 113 Hodge Avenue, Buffalo, N.Y.

Technology Club of the Connecticut Valley

There has been little activity in the Club since the war started, because so many members are directly involved in the war effort. A meeting, patterned after the successful affairs of September and December, was held in April, and members were urged to return to the Institute on April 27 for the graduation exercises. — JOHN F. SEXTON '41, *Secretary*, 126 Maplewood Terrace, Springfield, Mass.

Washington Society of the M.I.T.

We are indebted to Henry D. Randall, Jr., '31, our Honorary Secretary, for the following report of our February meeting: The Society met at 5:30 P.M. on the fourth Friday of February at the Y.W.C.A. The meeting was called one-half hour later than usual to permit more members to attend. Henceforth we shall continue to meet at the later hour. Technology men who may be in Washington on the fourth Friday of the month will be welcome to attend our meetings.

J. B. Blandford, Jr., spoke on the activities of the Bureau of the Budget. At the time the meeting was announced he was assistant director of the bureau, but by the time of the meeting he had been named as the proposed chief of the National Housing Administration. Mr. Blandford outlined the functions of the budget director and shed considerable light on the many and important responsibilities which are covered by that particular office.

Nearly 20 per cent of the members attended in uniform. The following Alumni and guests were present: Granville H. Parks '87, C. Leonard Brown '88, George W. Stone '89, John G. Crane '90, George E. Stratton '96, Proctor L. Dougherty '97, William C. Arsem '01, Merton L. Emerson '04, Amasa M. Holcombe '04, Frank W. Milliken '04, George H. Shaw '04, George N. Wheat '04, Charles P. Kerr '11, Ronald M. Wilson '13, Hamat D. Manuelian '18, Louis J. Grayson '19, John Nolen, Jr., '20, Wendell P. Sammet '20, Kenneth Bernard '22, C. Ford Blanchard '22, Rudolf H. Blatter '22, Robert K. Thulman '22, G. Donald Fife '24, John D. Fitch '24, George E. Lamb '24, William D. Rowe '24, Harry B. Swett '25, Samuel J. Cole '26, Mary O. Soroka '26, S. Lindsay Lord '28, Nicholas P. Stathis '29, Albert F. Bird '30, J. Allan Mathews '30, Frederick W. Turnbull '30, Mario V. Caputo '31, Henry D. Randall, Jr., '31, L. William Glowa '32, Frederick M. Moss '32, C. Wallace Bohrer '33, M. Elsa Gardner '33, G. Bowditch Hunter, Jr., '37, James A. Smith '39, Robert W. McKinley '40, William G. Osmun '40, Jack H. Schaum '40, Eugene E. Crawford '41, Theodore H. Guething '41, Edgar E. Hayes '41, Philip C. Magnusson '41, Norman F. Vandervoort '41, W. Junge, and S. S. Hoexter. — AMASA M. HOLCOMBE '04, *Secretary*, 428 Munsey Building, Washington, D.C. WILLIAM K. MACMAHON '22, *Review Secretary*, Rosslyn Gas Company, 3240 Wilson Boulevard, Arlington, Va.

CLASS NOTES

1876

Waldo E. Buck, President of the Worcester Manufacturers Mutual Insurance Company for the past 43 years, resigned from that office at the annual meeting held in March. He was made president emeritus of the company. Buck is succeeded as president by Marshall B. Dalton '15. Both Buck and Dalton were elected to the executive and finance committees of the company. — CHARLES T. MAIN, *Secretary*, 201 Devonshire Street, Boston, Mass.

1886

Charles H. Herrick, recently elected Secretary of 1886, School of Mechanic Arts, writes The Review as follows about the activities of his classmates: Our biggest news item is the notation of our 55th reunion, held at the Parker House, Boston, on June 10, 1941. Luncheon at one o'clock was followed by a class social until five. Present were Henry P. Benson, Ambrose Walker, William C. Smith, Frank S. Wilson, Howard G. Noble, Fred J. Arnold, Charles E. Holmes, Fred A. Whitney, and Charles H. Herrick. Class ladies gracing the reunion were Mrs. Benson, Mrs. Walker, Mrs. James T. Ball (widow of our first Secretary), Mrs. Whitney, Mrs. Noble, with Mrs. Theodora Harding and Mrs. Genevia Eagan (daughters of Noble), and Mrs. Arnold, with Mrs. Margaret Thompson (daughter of Arnold). — Election of officers made Henry P. Benson president and treasurer, and Charles H. Herrick secretary to succeed James T. Ball, whose efforts, untiring work, and affection for his classmates are mainly responsible for our class solidarity to date. — Our group numbered 47 at graduation. In addition to the nine members who attended our 55th reunion, five others living at long distances from Boston sent regrets. This, it is thought, is a remarkable showing for a Class out 55 years. We hope to get in touch with a few members who have not reported recently and to interest them in our next meeting — our 56th reunion — which will be held next month.

It is our sad duty to record the following necrology since the last reunion of '86, S.M.A.: Fred J. Arnold of Waterville, Maine, on December 25, aged 75; Clarence W. Fearing of South Weymouth, Mass., on March 1, aged 92. — Loyal classmate, successful businessman, prominent in club, fraternal, civic, and religious affairs, Mr. Arnold was highly respected by everyone with whom he came in contact. Professor Fearing was our instructor in English, and in his death we have lost a "landmark" of our education and an "institution" of our Class. We all loved him, and he in turn loved "his boys," as he called us. As an educator he ranked with the best. He was keenly interested in the affairs of his town and for many years was a deacon in its Congregational church. Our Class was represented at the services by the Secretary, and a floral tribute, accompanied by a letter of con-

1886 Continued

dolence, was sent from our President, who was unable to attend.

Professor Fearing's passing will recall fond memories of his colleague, Professor James R. Lambirth, affectionately called "Pa" by all Technology men, who was three years older than Professor Fearing but passed on before him at 91 years. Pa was our instructor in metalworking, metal casting, and forging, and no finer man or more capable instructor ever taught at the Institute. Both of these Professors were especially fond of our Class and were our honored guests at every one of our reunions up to and including our 50th. They were greatly missed at our 55th, as Professor Lambirth had left us and Professor Fearing was too feeble to make the effort to attend. The Class at its 55th reunion sent him a telegram of greeting and affection which Mrs. Fearing later acknowledged as having been of much help and comfort to him and to his family. — ARTHUR G. ROBBINS, *Secretary*, 12 Grove Street, Winchester, Mass.

1887

The Secretary must apologize for the dearth of class notes in recent months. As a matter of fact, many of our classmates who have passed away in the last two years were among the best correspondents. Many classmates are rarely heard from these days. On a recent trip to Boston, our classmate N. P. Ames Carter entertained Cole, Kendall, and Tripp at a luncheon at the Vendome Hotel. President Taintor, Nutter, and the Secretary were unfortunately unable to attend and thereby missed a very enjoyable affair.

Both Sever and Brett have been heard from recently, but although they are apparently in good health and spirits, they confined themselves to messages of remembrance and good wishes to their classmates. — Lonsdale Green and Dick Schmidt have also been heard from, but a number of other classmates to whom the Secretary has written have not yet answered. — NATHANIEL T. VERY, *Secretary*, 15 Dearborn Street, Salem, Mass.

1888

For the fourteenth year, Edwin S. Webster, our Class President, has invited us to his summer home for our annual dinner. This will be our fifty-eighth dinner and will be on Tuesday, June 2. As you all know, Webster's estate is located at 307 Hammond Street, Chestnut Hill, Mass. The time for arrival is after 5:30 P.M. Inspection of the gardens will be at six o'clock, and dinner at 7:00. Dress will be informal. Invitations will be sent to the 75 men now listed on our class roster.

Our Assistant Secretary, Sanford Thompson, writes from Washington that he is planning to be present at the class dinner in spite of his arduous duties in helping Robert P. Patterson, Undersecretary of War, speed up the manufacture of the materials and munitions needed for the successful prosecution of the war. — Herbert Bird says that after 51 years he doesn't have to go to the factory any more, so he has retired to the country in New Hyde Park, Long Island, N.Y. He has a cozy little home with his youngest daughter, who was married last summer. Herb has six grandchildren to keep him interested and youthful. — Ted Foque is always happy, or at least his letters indicate that he is. He agrees with your Secretary that when our Navy gets going, it will show the Japanese and the Nazis a few things. He also says that Fred Ellis is traveling to Philadelphia and Memphis. We expect an account of his trip in our next class notes.

Nickerson made the original survey of Beachwood, N.J., almost 30 years ago. He has done more than anyone else to develop it from nothing to a summer resort having a population of over six thousand, with one thousand year-round residents. Beachwood is located about 50 miles from both Philadelphia and New York on the beautiful Toms River near Barnegat Bay.

In our notes for December, we gave an outline of the life and activities of Ellery F. Coffin, who was with us during our freshman year. We have just received word from his sister that he passed away on March 10 at Beltsville, Md. Surely our ranks are thinning faster than we like to think.

When you read this, your Secretary will be at his island home, which is guarded by hundreds of soldiers with searchlights and guns. On his daily trip to his private bathing beach, he will have to pass through a camp of Uncle Sam's defenders. — BERTRAND R. T. COLLINS, *Secretary*, Chebeague Island, Maine. SANFORD E. THOMPSON, *Assistant Secretary*, Thompson and Lichtner Company, Inc., 620 Newbury Street, Boston, Mass.

1890

We were delighted to receive a call from Whitney, who came to the Institute to attend the quarterly meeting of the Corporation, of which he is a life member. He and his daughter had been vacationing at a dude ranch in Tucson, Ariz., as Nassau, their usual winter resort, was hardly the place to choose for a vacation under the present conditions. Willis is in fine form and has lost none of his old enthusiasm for research, in which he is still actively engaged.

This winter, Goodwin and his wife were all set to go to Mexico for a six weeks' trip, but the Monday after the Pearl Harbor attack they canceled all reservations. — Packard received his certificate as a member of the Legion of Honor at the annual meeting of the American Institute of Mining and Metallurgical Engineers in February. Following that, he went to Mexico, where for two weeks he saw no newspaper, heard no radio, nor in any way received information about what was going on in the outside world. His reaction upon returning home was that a tremendous amount of energy is being used in writing useless detailed descriptions, columns, and radio addresses, and that even *Time* magazine has become verbose.

Charles M. Watson died on February 20. He was a special student in Course VI. Charles lost one of his legs and had been an invalid for a long time. — GEORGE A. PACKARD, *Secretary*, 50 Congress Street, Boston, Mass. HARRY M. GOODWIN, *Assistant Secretary*, Room 4-242, M.I.T., Cambridge, Mass.

1892

Albert P. Mathews is now a professor emeritus of the University of Cincinnati, Ohio. He was head of the department of biochemistry at that university. Previously he was chairman of the department and professor of biochemistry at the University of Chicago. He has received a doctor of philosophy degree and an honorary degree of doctor of science. He is a member of many professional societies, both American and foreign. Mathews is a trustee of the Marine Biological Laboratory in Woods Hole, Cape Cod, Mass., where he now lives.

Charles H. Chase is now professor emeritus of Tufts College Engineering School. Chase's work has been in three general divisions — as a citizen, a teacher, and a professional engineer. He is chairman of the trustees of the Stoneham Public Library, and has been chairman of the Boston section of the American Society of Mechanical Engineers, chairman of the Republican Town Committee of Stoneham, and chairman of the Stoneham Public Library addition. He was a member of the engineering faculty of Tufts since its organization and advanced to the position of professor of steam engineering. Upon his retirement in 1940 after 43 years of active teaching, he was given a testimonial dinner by the engineering school faculty. As a professional engineer, Chase conducted various tests and designed several important devices, including a continuous-type needle loom. For a side line he had a ginseng garden and with some success has raised and marketed the root from seed to shipment. He has three children and four grandchildren. His son Donald C. is a graduate of M.I.T., Class of '26.

Carey Congdon is director of finance of New London, Conn. He has been treasurer of that city and has served continuously in its various departments. "Fifty years of faithful service" is a quotation from resolutions about him adopted by the Municipal Finance Officers Association of United States and Canada. Congdon has found much pleasure and happiness in Masonic work in the Scottish Rite and has received many honors. He presided over Lodge Chapter Council and Commandry and was elected grand commander of the Grand Commandry of Knights Templar of Connecticut. He was master of the Lodge of Perfection and took active parts in the Consistory degrees and was crowned an honorary 33d degree Mason in 1909. Congdon was a first lieutenant in the Connecticut Volunteer Infantry in the Spanish-American War and was a captain and intelligence officer in the Connecticut State Guard in World War I. He has been president of many clubs and societies.

Charles H. Muhlenberg, a consultant architect of Reading, Pa., has been presi-

1892 Continued

dent of the Chamber of Commerce and president of the American youth hostels. He organized and supervised the emergency hospital in the influenza epidemic, and has had charge of the unemployment gardens.

Edward C. Wells is president of the Platt Iron Works, manufacturers of pumping machinery at Dayton, Ohio. Previously he had been treasurer and chief engineer of the Quincy Engine Works and superintendent and chief engineer of Hardie-Tynes Manufacturing Company, Birmingham, Ala. For many years he has been active in local and state affairs but says that "for the past five years I have lived in the country and have found it necessary to shed many 'goat feathers,' so that at present my public interests are being a member of board of directors of the Ohio Chamber of Commerce, a member of board of trustees of Ohio Institute of Pharmacy, and a member of the advisory board of the community chest of Dayton." Wells has four children, all married, and eleven grandchildren.

Harry A. Burnham is still active as an engineer with the Associated Factory Mutual Fire Insurance Company, Boston.— Herbert R. Fitch, who has his own studio in San Diego, Calif., is the pioneer photographer of that section. — David Whiting, the former Treasurer of David Whiting and Sons, is retired and living at Wilton, N.H. He has five children and ten grandchildren. — George F. Low is retired. His activity has been in financial fields, and he was in a Boston bank for 20 years following about 20 years' service with several other firms. — Notice has been received of the death of Frank Yoerg on July 13.

Francis Walker is now retired after very active service. He has been professor of economics at Colorado College, professor at Western Reserve University, examiner with the Bureau of Corporations, Washington, D.C., deputy commissioner of corporations and chief economist of the Federal Trade Commission until 1940. He received a doctor of philosophy degree from Columbia University and studied in Munich and Berlin universities. During World War I, he was with the Federal Trade Commission in charge of cost finding for price control. From strategic positions in the Federal government he helped to develop, by scientific methods of inquiry, a better knowledge of private business enterprise in respect to organization, finance, accounting, production, transportation and trading policies, competitive methods, and so forth. He also helped to work out methods of improving these which would thus tend to protect business enterprises from their real enemies. He was guided by the idea that properly conducted private business enterprise is an indispensable factor in the development of individual liberty and national welfare.

George H. Goodell died of a heart attack in the Minnesota Club, St. Paul, on December 27. Goodell was a well-known railroad engineer. He served as mechanical engineer with the Erie Railroad Company and the Northern Pacific Railway Company and subsequently entered the railroad supply business. — Daniel F. Potter was stricken ill on a bus as he was going to his office and died on March 6. Potter was an electrical engineer for the General Electric Supply Corporation at Buffalo. — CHARLES F. PARK, *Secretary*, Room 5-111, M.I.T., Cambridge, Mass.

1893

Arthur E. Fowle retired about 15 years ago from his position as vice-president and treasurer of Libbey-Owens Sheet Glass Company of Toledo, Ohio, and took up fruitgrowing at La Esperanza Ranch, Los Altos, Calif., where he still makes his home. He finds that a farmer's life is surely strenuous but more than pleasant. In a recent letter he says: "You can imagine what a continued disappointment it has been to me to miss all class and alumni activities since graduation. I've always been too far away. I intend to be there for our 50th anniversary, or else."

Frederic W. Lord received newspaper publicity last winter for his gift of an 1811 bottle of Napoleon brandy to Winston Churchill during the British Prime Minister's visit to the United States. According to the New York *Times* of January 11, "A gentle rain of gifts for Winston Churchill has been falling on the White House ever since the Prime Minister's arrival in Washington." Fred Lord's gift was the oldest and choicest of several bottles of brandy.

It was in 1895 that Fred Lord, in association with T. P. Curtis '94 and R. H. Hallowell, Harvard '93, formed the Lord Electric Company, with office in Boston. In 1904, the company opened an office in New York, where Fred Lord has been ever since. Last year he retired as president of the company but continues to serve as chairman of the board.

For the past eight years Percy H. Thomas has been connected with the Federal Power Commission, for a time as regional director of the commission's Atlanta office and then at its headquarters in Washington, D.C., where he is chief of the power requirements division. Both at Atlanta and at Washington, he has served as an honorary secretary of the Institute. The work of this position consists in furnishing information and counsel to prospective Technology students and advising the Institute concerning these men.

Albert Richard Beddall died at his home on Stowe Road, Marlboro, Mass., on November 3. He was born on April 4, 1870, in Birmingham, England. He was a student with the Class in the Course in Biology and Public Health. Three years after leaving Tech, Beddall took up the study of medicine at the Harvard Medical School. He later became a traveling representative for the pharmaceutical firm of R. W. Gardner, Orange, N.J. After nine years of traveling through the states east of the Mississippi, he became New England representative of that firm. He then purchased a farm in Marlboro, where he made his home until his death. In 1902 he married Helen Weston Pierce. They had no children.

Samuel Douglass Dodge, who was graduated from the Course in Civil Engineering, died on December 11 at his home in Suffern, N.Y., from a heart attack. He was born on November 29, 1870, at Grinnell, Iowa, a descendant of an old New England family. Following his graduation, Dodge was connected for a short time with the Institute and then did some work on surveys for the water board of Winchester, Mass. During the next ten years he was with the distribution department of the metropolitan water board of Massachusetts, working on location surveys and construction of pipe lines, reservoirs, water towers, and a subaqueous tunnel. For the next ten years, he was in charge of the location and construction of a section of the Catskill aqueduct and later on did statistical and literary work on a history of the water supply board of New York City.

During World War I, Dodge was supervising engineer and production engineer in the Ordnance Department of the United States Army, supervising the building of a water-supply system at Nitro, W.Va. Later he was connected with the New York Ordnance District in the production of picric acid and in the settlement of claims. After the War, he became treasurer of the Richmond Screw Anchor Company, Brooklyn, N.Y., a position which he held until his retirement from active business some years ago. He is survived by his widow, Mrs. Margaret Stone Dodge, and a son, David.

Theodore Taylor Dorman, X, died on January 6 at his home at 30 Bradford Avenue, Upper Montclair, N.J., after an illness of three years. Born at South Hadley, Mass., on September 11, 1871, Dorman lived in Montclair throughout most of his life. From August, 1894, to September, 1899, he was an assistant examiner in the Patent Office at Washington, D.C. While holding this position, he studied general and patent law, receiving the degrees of master of laws and master of patent law from George Washington University, and was admitted to the bar of the District of Columbia in 1899. In the latter year he became law clerk with Wetmore and Jenner, New York City, with which firm he remained for three years. During that time he was admitted to the bar of the supreme court of the state of New York. He was attorney for Peter Cooper Hewitt when he obtained a patent for his mercury vapor lamp. In 1902 Dorman left the law firm to join his father in the management of the latter's business, Amory, Brown and Company, a New York wholesale dry goods firm. From this firm he retired in 1913 to serve as executor and trustee of the estate of his father, Franklin W. Dorman.

Dorman had been actively associated with the Boy Scout movement in Montclair since 1912, when he became scoutmaster of one of the first troops. He served on many Scout committees and boards, and in 1931 he was awarded the Silver Beaver, one of the highest honorary decorations in Scouting. In 1939 he was named Scout commissioner emeritus, one of the few in the country to receive the honor.

1893 Continued

Dorman was a member of Union Congregational Church, a trustee of Mount Hebron Cemetery Association, and a former member of the Commonwealth and Upper Montclair country clubs. He leaves his wife, Mrs. Frances Hayes Dorman; a son, Charles Cole Dorman of Columbus, Ohio; two daughters, Mrs. Dorothea Blumenthal of Montclair and Mrs. Frances Menning of Essex Fells; two brothers, Thomas B. Dorman of Montclair and Dr. Harry G. Dorman of Cambridge, Mass.; and three grandchildren.

Among the '93 men who reported Florida addresses the past winter were William W. Carter, 1508 Northeast 110th Street, Miami; Howard A. Gilson, 235 27th Avenue, North, St. Petersburg; and John C. Hawley, Post Office Box 1325, Delray Beach. The Secretary does not know whether these changes of addresses are permanent or merely temporary, although from the records of the Register of Former Students they would appear to be permanent. — Other changes of addresses are those of George W. Andrews, Greenacre and Overlook Drive, Hillandale, Silver Spring, Md.; Edward J. Holmes, Wildmeadow, Topsfield, Mass.; Walter I. Swanton, 232 North Stanwood Road, Bexley, Columbus, Ohio. — FREDERIC H. FAY, *Secretary*, 11 Beacon Street, Boston, Mass. GEORGE B. GLIDDEN, *Assistant Secretary*, 551 Tremont Street, Boston, Mass.

1894

Since the last batch of notes was written, the Secretary has been extremely busy and has had a few most interesting contacts with fellow classmates. During the month of January he had occasion to go to the West Coast in connection with some work he is doing as special consultant for the subsistence branch of the office of the quartermaster general. On this trip he was accompanied by Charles S. Hanes of Cambridge, England, a representative of the British Scientific Commission, and R. S. Hollingshead from the division of agriculture and engineering chemistry of the United States Department of Agriculture. Our object was to make a survey of the facilities available for the dehydration of vegetables for use by the Army and Navy. As the western regional laboratory of the Department of Agriculture is carrying on investigations in this field under E. M. Chace, this laboratory was made the first objective and several days were spent in the San Francisco Bay area in a survey of plants now operating. Later a few hurried days were spent in southern California, and several large plants were visited in and about Los Angeles. The Secretary then went north to Seattle and Everett, Wash., and on the way back to Chicago visited a large potato-drying plant in Idaho. The shortage of tin is causing curtailment in canning. The evident savings which may be made in weight and space by use of dehydrated vegetables make use of them highly desirable, if products of satisfactory quality are obtainable. — In Berkeley, Calif., the special high spots of pleasure for the writer were meetings with Austin Sperry and his charming wife. With characteristic hospitality they promptly invited not only your Secretary but three associates to dine with them. A most enjoyable evening was the result. Two daughters of the family came in during the evening and added to the pleasure of the occasion. It is evident that both Austin and his wife are active in all sorts of good works in their home city. Before leaving the district, I had the great pleasure of lunching with Sperry at the famous Bohemian Club, of which he has long been a member, and of seeing and learning something of the activities of this club, which is known throughout the world for its unique entertainments and splendid hospitality. Naturally, we recalled the events of the 45th reunion, and both Austin and his wife were enthusiastically looking forward to our 50th two years hence.

My time in both San Francisco and Los Angeles was so short and so fully taken up with the work in hand that I did not have the opportunity to look up or even to telephone a number of '94 men who at last accounts were located in or near these centers. A letter had been sent in advance to Price in the hope that he might be available for a luncheon at least, but no luck.

Shortly after my return from the Coast, I received a notice of Frank Drake's address, 123 Locust Street, San Francisco. It would have been especially interesting if I could have met Drake while in San Francisco, as I have not seen him since 1894.

The Secretary had a long and interesting letter from Kittredge some weeks ago. At the time Kit was living in New York, but since then he has moved to 326 Wayne Street, Highland Park, N.J. He enclosed for my reading several thoughtful papers on patents and technological unemployment, and on the use and abuse of patents in general. According to Kittredge, the way of the inventor is often very hard. The resistance and, frequently, the ignorance encountered in the Patent Office and sometimes in the offices of the companies which could be most benefited by inventions and patents are disheartening, as is also the constant struggle to protect one's invention after it has once been accepted as a valid means of making a new idea useful to industry and for the public good. It is suspected that most inventors would agree with Kittredge that the problem of patent protection is still far from solved.

Speaking of inventors, one of our experts, W. H. Pratt, whose activities in this line have been exceptional and were mentioned in the notes of a previous issue, is now spending a large part of his time in one of the numerous defense research groups working at the Institute. The nature of his work cannot of course be divulged. — A pleasant letter came in from George Taber, commenting on the approaching retirement of the Secretary as a member of the Institute Faculty and administration. George also enclosed a touching poem relating to the death of his intelligent and deeply mourned companion of several years past, his dog Duke.

Other fine letters regarding my retirement have come from Wint Parker '95 and from Billy Sayward. They are greatly appreciated. By the time the next batch of notes is in print, the deed will have been accomplished, and the Secretary will be emeritus. He looks forward to doing many interesting things which have been held in reserve for this period of greater leisure. He is proud to add that the President and the Corporation have made him an honorary lecturer for 1942–43, a fine title conferring no specific duties except those of his own choice and the distinction of retaining a connection and an office at Tech, where he has spent more than half a century. There are so many interesting things to do that retirement cannot be looked upon as a relegation to the dump heap of worn-out machines, but as freedom to turn to new opportunities and activities. Perhaps one of the results will be that he will do a better job as secretary between now and our fiftieth reunion in '44. — SAMUEL C. PRESCOTT, *Secretary*, Room 3–207, M.I.T., Cambridge, Mass.

1895

Our readers will be delighted to learn that we have heard from one of the Matthes twins. On March 8 Gerard wrote from Vicksburg, Miss., as follows: "Just a line to say that life is still full of interest. In fact, I have never known a dull moment. I'm still with the Mississippi River Commission, nowadays as head engineer and consultant to the President, Max C. Tyler. My job concerns the antics of Old Man River, who has never ceased to be spry.

"I have been connected with the river-work here since 1932, for the last 10 years as principal engineer in the office of the President, and have had much to do with planning the system of cutoffs and flood-stage lowering between Cairo and New Orleans. I've had the satisfaction of seeing tangible results in the shape of nearly 150 miles of river shortening and an increase of flood-carrying capacity at Vicksburg of 50 per cent, increasing to over 60 per cent below the mouth of the Arkansas River. Fifteen cutoffs are in operation, 14 of them navigable for large commercial barge-line traffic. The fifteenth is less than a month old but doing well. There is still a sixteenth about to come into existence. All of this keeps one's interest, much like watching children grow up. Each has an appropriate name. The youngest child is Sunflower Cutoff. Wish Mark Twain could have lived to see the changes that have been wrought. Mark, by the way, understood the river as few did in his days. Much hokum has been written about the Mississippi, but Mark Twain did not go astray, and that is saying a lot, as reliable engineering data were mighty scarce to draw conclusions from, then.

"My sole hobby is river hydraulics. Hope some day to find time to finish a textbook on that much misunderstood and controversial subject. After reading all the texts and listening to all the opinions, I decided some years ago to go to Nature, to learn her secrets directly, and I have been at this in a big way. Direct

1895 Continued

observation of natural streams beats watching experimental models. It takes time and travel to see streams large and small in all their moods, but it has proved to be the most fascinating job I have ever had. The art consists, of course, in learning how. I am still in the best of health despite war, floods, and a cockeyed world. My wife is at my side, and my daughter, who lives in Arizona, is raising three children. I hope to see you and many of the old Class soon." — LUTHER K. YODER, *Secretary*, 69 Pleasant Street, Ayer, Mass.

1896

Every classmate should have received the report of the M.I.T. Alumni Fund as of February 15. We may take some pride in finding that the Class of '96 exceeded its quota in the number of contributors, but it failed rather badly in the amount contributed, since it made only 50 per cent of its quota because of the low average of slightly over $11 per contributor. It seems as if our Class, which has been graduated over 45 years, ought to make a higher average. We also ought not to forget that only the amount of any contribution that is in excess of $5.00 goes to the benefit of M.I.T. Under the new schedule, the fiscal year for the Alumni Fund starts on April 1, so all of us can have an opportunity to consider our contribution of the preceding year with the objective of increasing it this year.

Undoubtedly a number of our classmates spent the winter in Florida. Con Young's report appeared in the last Review. Word has now been received from John A. McIlvaine, Jr., who wintered at Delray Beach, Fla. Indirectly the report has come that the Myron Leslie Fullers were at Fort Myers and started early in March to motor north by a rather devious route. Con Young made no mention of having seen the Fullers at Fort Myers.

A letter has come from Lou Morse telling how in the early part of December he caught cold on one of his trips to Washington and was unable to throw it off, with the result that pneumonia developed and he was out of his office about 10 weeks. At the time he wrote, in the middle of March, he was still taking things easy, but expected to be back to normal in a few weeks.

Dr. Rockwell left on March 25 for Lansing, Mich., to attend the national collegiate wrestling championships held there March 26 to 28. John holds the position of secretary of the rules committee. From Lansing he went to his old home in Harriman, Tenn., to see his family there for two or three days and then returned to Boston. He made the entire trip by train this year. Perhaps he had it in mind that last year when he made the trip by automobile he had the misfortune to become ill.

George L. Farley, who passed away in Amherst, Mass., last September 10, was born in Lynn, Mass., on May 27, 1873, the son of Joseph S. Farley. He was married and had three children, of whom one is deceased. During our sophomore and junior years he was a student with us in Course I. Later he received from Dartmouth the degrees of B.S. in 1898 and M.S. in 1913. Positions held by him were, successively, grammar school principal in Hyde Park, Mass.; grammar school submaster and principal in Cambridge, Mass.; grammar school principal in Brookline, Mass.; superintendent principal in New Haven, Conn.; superintendent of schools in Brockton, Mass.; and teacher in the college extension department, Massachusetts State College. George was state leader of 4-H Club work, a Mason, an Odd Fellow, a member of the Grange and of Phi Kappa Phi and Epsilon Sigma Phi. Many annual reports and bulletins were products of his pen. — CHARLES E LOCKE, *Secretary*, Room 8-109, M.I.T., Cambridge, Mass. JOHN A. ROCKWELL, *Assistant Secretary*, 24 Garden Street, Cambridge, Mass.

1898

George Cottle has again become a busy manufacturer. The entire production of his gear factory is devoted to war work, and the volume of production has multiplied several times recently. He puts in about 16 hours of work a day. For a long time George had been planning a three months' trip, beginning in January. He had hoped to take an extensive trip by auto and by air, but the entrance of the United States into the war altered his plans. He contented himself with an automobile trip with his sisters through Florida to Key West, and then along the Gulf Coast to Texas, where he visited Amos Robinson '96 at San Juan in the Rio Grande Valley. George then went to Southern Pines in North Carolina, where his sisters planned to stay for the rest of the winter. He came back home to work after having been gone about six weeks in all. George took many pictures on this trip, and we hope to have a local class gathering so that we can all see these pictures and also see again the films he took in Java, Bali, India, Burma, and British Malaya when he was a man of leisure and devoted himself to travel.

An article in the *Hampton Chronicle* of Westhampton Beach, N.Y., was headed, "Roger W. Babson, Leading Business Commentator." We shall not repeat the part of the article that gave Roger's life history, but the concluding remarks may be of interest: "Mr. Babson celebrates this year the writing of his 21st Annual Business and Financial Outlook for North American papers. His uncanny record in looking ahead will make this one of the big stories of the year. . . . You will want to read Babson's clear, concise forecast and optimistic story of coming trends for living costs, rents, wages, jobs, inflation, war, and other factors in the economic picture. . . ."

This year the M.I.T. graduation and the Alumni Dinner were held in April. Next year, 1943, will be our 45th anniversary, and we must have some sort of an observance. How extensive an observance we have will depend upon the progress of the war and the date of Alumni Day. The committee will be glad to receive any suggestions from classmates. Please keep this 45th reunion in mind and make plans to attend.

Our classmate Arthur F. Porter died on February 8 at his home, 260 Fisher Avenue, Brookline, Mass. He had long been connected with E. I. du Pont de Nemours and Company, Inc. During the first World War he was in charge of one of the largest units of the company, manufacturing explosives. Some time ago Porter retired from active management, but he stayed with the company in an advisory capacity. — We have just received word of the death on March 18 of Isabel Bevier, who was a professor at the University of Illinois.

Henry H. Clark, IV, director of the Cleveland School of Art, has moved to 2385 Kenilworth Road, Cleveland, Ohio; Fred C. Plumer is now at 28 Thornton Park, Winthrop, Mass.; and Ashley B. Whitmore has moved to 1225 Linden Avenue, Dayton, Ohio. — ARTHUR A. BLANCHARD, *Secretary*, Room 6-421, M.I.T., Cambridge, Mass.

1900

Charlie Leary sent in the following letter: "I know you will be glad to learn that Fred Lawley has been dragged out of his retirement as a boatbuilder and is now president of the Westergard Boat Works of Biloxi, Inc., Biloxi, Miss., building 110-foot submarine chasers for the Navy. The company held its first launching on January 25, with Mrs. Lawley as the sponsor. — My son John has just been ordered to duty in Virginia as a lieutenant in the antiaircraft division of the Coast Artillery. He was a student at the University of Michigan and had hoped to finish his year there, as he is only 20 years old, but I guess 'the tall man with the gray beard' is beginning to wake up."

Jim Patch was one of the speakers at the dinner meeting of the Baptist Social Union, of which he is president, at the Boston City Club on March 2.

We are greatly indebted to Miles Sherrill '99, Professor of Chemistry at the Institute, for his consideration and thoughtfulness in sending the Class the following letter: "A classmate of yours and a very close personal friend of mine, Herbert A. Macpherson, died suddenly on March 9 in Green Bay, Wis., after a brief illness. I am appending a brief account of his life since graduation.

"Hype, as he was known to many of his close friends, was graduated from the Course in Naval Architecture but followed his chosen profession for a few years only. He was employed first by a shipbuilding concern located at Sparrows Point, near Baltimore, Md., and later by the Fore River Shipbuilding Company in Quincy, Mass. He was next employed by by the Western Electric Company, Inc., in Philadelphia, but was soon transferred to the statistics department of the American Telephone and Telegraph Company in Boston and in New York. In this work he was closely associated with Walter S. Gifford, a Harvard graduate, who is now president of the company. The two became lifelong friends.

1900 Continued

"Hype was married in the summer of 1913 to Hortense Joannes of Green Bay, Wis. A year or so thereafter he severed his connection with the telephone company and entered the employ of Joannes Brothers Company, a large wholesale grocery firm in Green Bay. At the time of his death he was secretary of this company, in charge of personnel, and one of its buyers. During his residence in Green Bay, Hype was active in various community affairs. He was director of the Y.M.C.A. and was elected its president in 1936. He was vice-president of the Association of Commerce from 1938 to 1940, and served as director for several terms.

"Macpherson was keenly interested in sports, sailing being his first love. Last spring, through the courtesy of Jack Wood '17, we spent one whole afternoon on the Charles River basin. We tried out not only the dinghies but also a newer type of sailing craft known as the Lawley 110, designed by another classmate of yours. That afternoon remains for me a happy memory. — In more recent years Hype took up aviation, and he became an expert flier. During the winter months he frequently took short fishing trips in Florida or West Coast waters. He and his wife spent one winter vacation in Honolulu.

"Macpherson is survived by his wife; one daughter, Barbara, a senior at Connecticut College for Women in New London; and a brother, Dr. C. W. Macpherson of Medford."

Some recent changes of address are the following: Cyrus H. Hapgood, VI, 85 Van Reypen Street, Jersey City, N.J.; James T. Harahan, II, Hotel Ambassador East, Chicago, Ill.; Frank R. Walker, IV, 1240 Huron Road, Cleveland, Ohio. — C. BURTON COTTING, *Secretary*, 111 Devonshire Street, Boston, Mass.

1901

We were glad to receive a note from Ellis Lawrence, who lives in Portland, Ore. He is a member of the architectural firm of Lawrence, Holford and Allyn. The firm has recently completed a contract for plans of a proposed $25,000,000 army cantonment for 35,000 troops. Last year it acted in a similar capacity for an airport cantonment for 5,500 men. Ellis has been dean of the school of architecture and allied arts at the University of Oregon since 1914. He says that his associate, William G. Holford, has served for several years as state architect for the Federal Housing Administration.

John Boyle, Jr., thinks that it was a good thing to omit the '01 notes in the March issue, as it brought home to him that "the Secretary cannot originate news; he can only transcribe what the members furnish." We hope that this point will not be lost on some other members of the Class. John is a patent attorney in Washington, D.C. He took the Mining Course at Tech, as did your Secretary. Whether he ever did any mining engineering or not we do not know, but the nearest yours truly got to mining was a few months spent in helping to dig the first East Boston tunnel. Then in 1902 I landed a life job as an engineer with the American Telephone and Telegraph Company.

John says: "I am still practicing patent law. Contrary to the general notion, wars have a devastating effect on the patent business. The annual report of the commissioner of patents for the fiscal year ending July 1, 1941, shows a 10 per cent drop in the number of patent applications filed, and the number filed about equals the depression year of 1934 and the war year of 1918. If the war continues for a long time, an even greater drop may be expected. Part of this falling off is due to the almost complete stoppage of foreign applications. Also, production is the important thing in wartime. In peacetime, competition stimulates industrial research and patent litigation.

"I have just finished the trial of a patent infringement suit that lasted for 83 trial days, resulting in 9,000 pages of testimony with more than 700 exhibits. There is much justifiable complaint about the expense of patent litigation. The President has recently issued an executive order establishing a National Planning Patent Commission authorized to see if there are obstructions in our existing system of patent laws and, if so, how they can be eliminated. Maybe the commission can furnish the answer to this problem."

Henry Chambers writes from Litchfield, Conn.: "While I am classified as 'retired,' I find my time as fully occupied as it was during my active participation in the grief of the railroads. Besides my activities about our home, the original portion of which was built in 1773, I find almost daily demands to operate as electrician, plumber, carpenter, glazier, or painter, to say nothing of occasional jobs as a mechanic on an automobile. With the day over, I stand watch for two hours until midnight, at present but once a week, at the Litchfield report center." — When not otherwise occupied, Henry devotes an appreciable amount of time to the interests and records of the class of 1899 of Yale, and so has a proper appreciation of class secretaries.

We record with regret the sudden death of Leon R. Thurlow in New York on March 2. He was vice-president and treasurer of the Decorated Metal Manufacturing Company, Brooklyn, N.Y.

In response to the annual class letter, LeRoy Backus states that he is in business in Seattle, Wash. He manages a number of business properties and supervises the investment of trust funds. He collects, and deals in, old master drawings and paintings. His first wife, Edith B., passed away on August 31, 1935. On June 28, 1941, he married Yvonne Dane, the former Countess de' Pazzi. — GUY C. PETERSON, *Secretary*, 788 Riverside Drive, New York, N.Y. THEODORE H. TAFT, *Assistant Secretary*, Room 3-266, M.I.T., Cambridge, Mass.

1902

Frank P. Montgomery, our Treasurer, died on March 19. While his death was not a surprise to his close friends and acquaintances, the news comes most unexpectedly to the rest of the Class. The end came after a prolonged illness in a New Jersey hospital, where he had been a patient since the first of last December.

Montgomery had long been a resident of Newark and was engaged in the insurance business almost from the time of his graduation. After 12 years of general experience in the employ of fire insurance companies, he started in the general insurance business for himself and was a consultant in fire prevention, especially for chemical works. He remained in the insurance business throughout his lifetime and at the time of his death was vice-president of O'Gorman and Young, Inc., insurance brokers in Newark, with whom he had been connected for the last 25 years.

Montie, as he was affectionately called by his friends, was a most loyal Alumnus and class member. He was a member of the Technology Club of New York from his early days in that city, where he maintained an office for years. As a class member he could always be counted on to carry more than his share of the load. His activity in community life is shown by the fact that at the time of his passing he was president of the Century Building and Loan Association of Newark, a member of the Essex Club, and a Mason. He also was serving as a trustee and treasurer of the Forest Hill Presbyterian Church.

Montgomery leaves his wife, Mrs. Louise Severance Montgomery; his daughter Eleanor, Mrs. Philip P. Parkinson, of Newark; his sister, Miss Ruth Montgomery; and his stepmother, Mrs. Adelbert Montgomery of Boston. — BURTON G. PHILBRICK, *Secretary*, 246 Stuart Street, Boston, Mass.

1905

Several emergency-appointed Assistant Secretaries accepted the Secretary's S.O.S. appeal to become news hawks and have contributed several stories concerning the war work '05 men are doing. From the February 17 issue of the New York *Herald Tribune* we learn that John C. Damon was called to testify at a Senate hearing on funds for the Office of Civilian Defense. The article reads: "Colonel John C. Damon, of the power and fuel division of the War Department, charged that the rural electrification administration had 'wasted copper' sorely needed for defense purposes in duplicating existing power lines in Kansas, Oklahoma, Texas and Arkansas. In one duplication in Texas he said 800,000 pounds of copper had been wasted. In another instance he said 3,335,400 pounds of copper are being used in constructing an R.E.A. line from Riverton, Kansas, to Lake Catherine, Arkansas, paralleling private lines already in use."

Gene Kriegsman is back in Washington "on the merry-go-round," so he says. "Got so dizzy that I fell off after seeing all those production men over at the Office of Production Management producing hob with industry. Finally I got reinstated at two-thirds my old salary and went to work with the housing division, now called the construction division, of the Federal Works Agency.

1905 Continued

We are responsible for constructing 50,000 demountable housing units to be ready for occupancy in June or July. My job is to contact the public works division and see that they provide the necessary public works and utilities for the housing sites. Details are omitted because of war necessity. In addition, I am also teaching classes in preforemanship two hours on Tuesday and Thursday evenings, as a part of the Defense Training courses to assist production. This course had a tremendous run in Pennsylvania, where I was teaching Engineering Defense Training mechanics this summer. I may think I am doing a lot, but the war needs call for a lot more, and unless we get at it at once we shall have many Honolulus of our own. Rents down here are scandalous, and accommodations are simply not to be had. I am glad to be quartered with friends. Colonel Damon lives four houses away." — Thanks, Gene. You are always constructing.

Bill Tufts writes: "I have joined hands with the War Department and am in plant-protection work in the Boston Ordnance District. My job is to prevent interruption of production, which you will agree is a large order. My work will keep me around here for a change." — This, by the way, must be appreciated right now, as Bill announces that "the best-looking grandson in the Class" was born on February 22. — Hub Kenway reports two additions to his family. One is his second grandson, Geoffrey, born on November 7. The other is a son-in-law, for his daughter Margaret was married on March 14 at Salem, Mass., to Frederick S. Haydon. Hub says that Doc Lewis and Bill Green, "representing the more respectable element of the Class," were present in cutaways and top hats. Rollie Prichard's widow also attended the wedding.

Jim Fouhy's letter is very newsy. He writes: "My elder girl is a teacher in the order of St. Joseph; in addition she is studying for her bachelor of arts degree. My second daughter is working for Uncle Sam, and my son, a civil engineer, is with the Turner Construction Company. My wife, as you know, is a Tufts graduate. Her activities include membership in the local school board.

"The civil engineers had a luncheon at the Technology Club of New York at the time of the American Society of Civil Engineers convention. Harry Gabriel was there. I hadn't seen him for years. I put in a plug for the next '05 reunion, so he should attend. He has had much experience traveling from Texas to Boston, from Alaska to South America, and after the last war he went to Russia with Herbert Hoover. Landers was also at the luncheon. He practices patent law in New York, but he tells me that inventors are all working for Uncle Sam. Louis Robbe has been recalled to the Army. He is a colonel of the Office of Civilian Defense and is in charge of the New York area." — Jim's letter is full of praise for the New York State law requiring the licensing of professional engineers. He is, by the way, acting president of the Kings County chapter of the New York State Society of Professional Engineers and a member of the state's legal committee.

Fred Bennett announces that he is a "has been" but expects to be in the running by the time of the next reunion. (Hope that isn't too far away, Fred.) He writes: "On Thanksgiving Day, after a clear record of perfect health for nearly 60 years, my old heart went back on me. Stayed in bed six weeks and am now only nursing myself along. Hope to get back to the office within the next month, but recovery seems to be a slow process. I was fortunate in not having any pain. . . . I had a letter from P. H. Physeck, I, who is now with the Boeing Aircraft Company at Seattle, Wash."

Bennett enclosed a letter from Hallet Robbins, who writes: "Acting on the premise that 'You Can't Take It with You,' I retired from active professional work at the comparatively tender age of 53. I didn't have a great deal of money, but my tastes and requirements are simple, and I have enjoyed life very much indeed, living in and traveling from place to place in a trailer. I have applied for reinstatement in the Army, but do not know if they will want me. I had a commission in the Officers' Reserve Corps, but it expired while I was in foreign parts, and consequently could not be renewed." — Robbins' address is now 2313 North Albemarle Street, Arlington, Va.

Ray Bell comes through with a very interesting account of his ramifications, as follows: "Up to October, 1940, I tried to amalgamate farming, yachting, and engineering into a life finale. Since then it has been an effort to make farming and war dissolve with the same objective. By the summer of 1940, I decided the rest of my active life was going to hover around Washington, so Mrs. Bell and I decided to pull away gradually from the *Yankee* and Bell's Roost at Northport, Long Island, and locate near the new scene of the crimes. After a search, we bought a plantation near Fredericksburg, Va. It's known as Chestnut Valley, headquarters of Stonewall Jackson during the winters of '62 and '63, and has about a thousand acres with a large Colonial mansion and several small dwellings, extensive woods, and eight streams of water.

"My war work has been of a vagrant character. For several months, I was consultant to Brigadier General Somervell, now a lieutenant general, who is chief of construction division. Following this, I spent a good share of the summer cruising in the *Yankee*. I meant to get back into war work by September but got occupied transferring livestock and equipment from Long Island to Virginia, and also in winding up my engineering offices. By December, however, I was set, and I took an apartment at 1712 16th Street, Northwest (phone Adams 8381), where I'll be glad to hear from any of the boys. I was engaged as liaison officer between the War Production Board and the Corps of Engineers, construction division of the Army, but I have recently transferred to the same status in the Navy Department. Most week ends I spend at Chestnut Valley, where we are getting into extensive farming. Some week ends I spend at Bell's Roost, which we still run in a small way. *Yankee* is still ours and bids fair to be until the end of war. My health is good, outlook broad, visibility low, and income negligible." — From a reunion standpoint, Ray, we hope you can't sell the *Yankee* ever.

The Boston *Herald* of March 17 contained a picture of a meeting of the air raid warden's committee of the Brighton, Mass., district, with our old friend S. Atmore Caine, XIII, among those present. — Frank Webster, whose permanent address is 5341 Harper Avenue, Chicago, Ill., tells us that while headed for a winter vacation in Mexico, he was taken with an attack of coronary thrombosis near Hot Springs National Park, Ark. The crisis was safely passed, but he is recuperating in the Ozarks, with the doctor's assurance that after a proper rest period he will be able to "take a position in some war plant where I can help whip the Japs and Nazis." More power to you, Frank. — With this collection of news, and more which we're keeping for next month, your Secretary feels regenerated and hopes to hold on until our next election day. — FRED W. GOLDTHWAIT, *Secretary*, 274 Franklin Street, Boston, Mass. SIDNEY T. STRICKLAND, *Assistant Secretary*, 137 Newbury Street, Boston, Mass.

1906

We are glad to be able to report upon the two members of our Class in Honolulu, as no doubt many classmates, like the Secretary, have been wondering how they were affected by the Pearl Harbor attack. Under the date of January 28, Charles E Locke '96 submitted the following: "Note written by Bill Furer in Honolulu on December 12 finally passed the censor. It was postmarked Honolulu, December 31, and arrived in Boston January 27. It reads as follows: 'Friday, December 12, five days after *the* day, Sunday, December 7 — an unforgettable day in our lives — this is being written in a closet off our bedroom, where we have rigged up a small table and lamp and where I may have to do my writing for the next few months (?) years (?).'"

Under the date of March 9, we received the following from Ray Philbrick. The letter was on the stationery of "The Oasis," Palm Springs, Calif.: "I have just received an interesting letter from Sid Carr who, you will recall, has lived in Honolulu for many years. The letter is self-explanatory, and because of the general interest in affairs over there it occurred to me that you might wish to make an excerpt from it for the '06 class notes. Sid was, of course, an honored member of the Course VI gang, and I am sure many remember him."

Following is the letter from Sid Carr, which was dated Honolulu, February 27: "Your letter of February 15 from Tucson, with a six-cent air-mail stamp, arrived here in the remarkably quick

1906 Continued

time of four days! It evidently came by clipper, and the customary twenty-cent clipper-mail postage was overlooked by the Post Office Department. I was glad to hear from you, especially regarding the '06 reunion at Marblehead and appreciate the photographs taken aboard Santry's yacht and at the luncheon at M.I.T. It is my recollection that I wrote you shortly after the Pearl Harbor attack on December 7, acknowledging your Christmas card, but I have written so many notes that I cannot definitely swear to it. Be that as it may, I will give you now a few highlights of the dastardly Jap trick, in so far as we are permitted by the censor.

"The radio news, the national magazines like *Life* and *Time*, and your newspapers relate all the facts pertaining to the military significance of the attack and the damage done, so that I will not repeat that information. I had just got up about eight o'clock on that memorable Sunday morning and had turned the radio on while I was dressing. The following announcement came over the radio: 'We are under an enemy air raid. Do not use your telephone. Do not drive your automobile. Keep off the streets. Stay indoors and be calm.' I could hear the roar of planes in the distance but thought it was a simulated attack and paid no further attention to it. We continued to dress and attend to our morning duties. We could see the burst of antiaircraft shells in the sky toward Pearl Harbor, but still thought it a practice raid as it was not announced that the attack was by the Japanese.

"I had a golf date that afternoon and about 9:30 A.M. the man with whom I was to play drove by in his car. I hailed him and asked him about the date. He then told me that the Japs were attacking us and related some of the damage downtown, as he had been there and was now on his way to guard some of our Hawaiian Electric property. I was still rather incredulous, until a shell burst on the side of Tantalus above our house, and the announcement was then made over the radio that martial law had been declared. This was followed by a proclamation by the governor. I was then convinced of the seriousness of the situation. So you can see that we civilians were also asleep. I was expecting war but did not think that Japan would resort to such trickery.

"About noon I took a walk up a hill overlooking the city, and two fires — a store and a schoolhouse — were visible toward the Waikiki district. I could not see Pearl Harbor as my view was obstructed by Punchbowl, but clouds of black smoke were pouring into the sky in that direction. There was comparatively little damage done downtown and in the residential district and no damage to our property. The Japs were after military objectives. None of the planes flew directly over Manoa Valley, where we live. Civilian casualties were light and did not exceed a hundred killed and wounded. All our friends escaped except one woman whom we knew through playing golf at the country club. She lived in Nuuanu Valley and was telephoning when an antiaircraft shell, fired at a low trajectory, burrowed beneath the house and exploded, blowing up the house and killing her instantly. Her husband was out of the house at the time.

"We have been under a continuous blackout since December, and the liquor ban was . . . lifted on February 24. We cannot be out after 9:00 P.M., so that the only way to have friends in for the evening is to have them stay all night. Our forces have been materially strengthened, and the town is full of sailors and soldiers. Believe me, the Japs will get a hot reception if they ever return here. We have our civilian defense well organized with air-raid wardens, first-aid stations, Hawaiian Territorial Guard, Red Cross work, and so forth. I have recently taken a course in first aid and have joined the Business Men's Training Corps, a regiment formed for protection and defense behind the lines. We drill regularly and have pistol practice with Colt automatics as well as attend lectures on fire, first aid, police duties, and other subjects.

"Business is going on, but everything is subordinated to the military situation. Labor is scarce on this island, especially agricultural and skilled labor, in spite of the thousands of civilian defense workers who have been imported. Food is plentiful, but we are encouraged to raise fresh vegetables in our home gardens, which everyone is doing. We have also been advised to build bomb shelters at our homes, and in a neighbor's garage I have constructed one which has four feet of stone wall on three sides. We have all been registered, fingerprinted, and issued identification cards and gas masks. The next issue is, I believe, tin hats. So you can see that we are thoroughly war conscious.

"Our two boys aged 22 and 20, are attending college on the Pacific Coast. The older one is a senior in Whittier College, southern California, and the younger, a junior in engineering at the University of Washington, Seattle. I have advised them both to enlist in the United States Naval Reserve training course for ensign's commissions, which permits them to graduate before taking the four-month course. Grace and I are both well, playing some golf, and thankful that the raid on December 7 was not worse. We are not downhearted and believe in ultimate victory. Kind regards and *aloha*."

Your Secretary acknowledges a post card from Henry Ginsburg and Mrs. Ginsburg, sent from Daytona Beach, Fla., March 6. The card said that they planned to be in Florida two months. — JAMES W. KIDDER, *Secretary*, Room 802, 50 Oliver Street, Boston, Mass. EDWARD B. ROWE, *Assistant Secretary*, 11 Cushing Road, Wellesley Hills, Mass.

1907

Frank MacGregor, who had been director of the priorities division of E. I. du Pont de Nemours and Company since June, 1941, became assistant general manager of the Roessler and Hasslacher Chemicals department of the Du Pont company in February. From 1907 until 1916 Frank worked as a metallurgist and consulting engineer, and during his 26 years with Du Pont he has served as assistant director of the development department, control manager of the paint department, general manager of the acele department of the former Du Pont Rayon Company, and president and general manager of Ducilo S.A. Productora de Rayon in Buenos Aires. Frank's business address is Room 3102, Du Pont Building, Wilmington, Del., and he lives at 2307 Ridgeway Road in Wilmington.

John Frank wrote me early in March that he had recently had lunch with Joe Baker. Joe has a real-estate business with properties in Chicago and Milwaukee, is married, and lives at 6355 South Laflin Street, Chicago. — On September 1, Fred Schmidt severed his connections with Elgin Academy at Elgin, Ill., where he had been since July, 1939 (see June, 1940, Review) and went back to Evanston, Ill., to live at 721 Simpson Street. He is an architect with the office of Schmidt, Garden and Erikson, the Schmidt of the firm being Richard E. Schmidt '87. He has had charge of producing plot plans for Camp Lawrence, United States Naval Station, Great Lakes, Ill. The drawings locate buildings, roads, walks, grades, and distribution of sewers, water, electric wiring, and heating mains. Fred's daughter Betty is on the art staff at Cornell College, Mount Vernon, Iowa, and his son Frederick is a soil analyst at the airport at Houston, Texas.

Stuart C. Godfrey is now a brigadier general, and his address is General Headquarter Air Force, Bolling Field, D.C. — Armen H. Tashjian's address is now Cambridge Apartments, Alden Park, Philadelphia, Pa. — In the Boston *Herald* of March 20 appeared a cut of a fine looking young man, beneath which was the caption, "Ensign Gardner S. Gould, Jr., son of Mr. and Mrs. Gould of Highland St., Newtonville, Mass., who has been assigned to naval air station at Jacksonville, Florida." He is a member of the class of '39 at Brown University and of Zeta Psi Fraternity. I understand that this young man's father, Tom Gould, is very busy doing extensive water-front engineering work at the navy yard at Charlestown, Mass. — BRYANT NICHOLS, *Secretary*, 126 Charles Street, Auburndale, Mass. HAROLD S. WONSON, *Assistant Secretary*, Commonwealth Shoe and Leather Company, Whitman, Mass.

1908

The third dinner and meeting of the Class in the 1941–42 season were held at the University Club in Boston on Tuesday, March 17, at 6:30 P.M. Through the kindness of Harold Gurney, the Class was invited to visit the studio of Leonard Craske, the well-known artist. This invitation resulted in a good turnout. The following were present: Appleton, Jeff Beede, George Belcher, Nick Carter, Cookie, Myron Davis, Paul Esten, Hobe

1908 Continued

Ferris from Akron, Lynn Goodman, Harold Gurney, Sam Hatch, Winch Heath, Linc Mayo, Art Skillings, Linc Soule, Joe Wattles, and Leonard Craske, our host of the evening. — We had planned to entertain at this meeting the sons of '08 now at Tech, but the boys felt they were being worked so hard they couldn't spare the evening.

After dinner we adjourned to Mr. Craske's studio. As we turned into Harcourt Street, we felt like freshmen again, as if we were going back to "Shop" and the "Old Union." Mr. Craske explained some of the mechanics of making a statue. One of his most famous works is the bronze statue of "The Gloucester Fisherman" in Gloucester, Mass.

Mr. Craske then showed us some very beautiful Kodachromes taken around Gloucester Harbor and at the Arnold Arboretum in Boston. As promised, he explained in detail how certain pictures were taken to get desired results. He gave us many valuable pointers on getting good pictures. The meeting was very enjoyable, and the Class is certainly indebted to Harold Gurney and Mr. Craske for making it possible.

The following note came from Arthur Gardner: "I am sorry I was unable to be at the class dinner on Tuesday, March 17, and that I forgot to send the card in. It seems that every time you plan to have a dinner I have to attend something else. However, I hope to go to one again sometime, as I enjoyed the last one I attended very much.

"I have been receiving notices for some time, but don't recall ever having paid anything to offset some of the expenses of sending out these notices. Hence I am enclosing a check for $5.00, which can be added to the treasury." — If some of the rest of the Class feel the same, their contributions will be very agreeable. You know we shall celebrate our 35th in June '43, and we must begin building up the treasury.

Waldo Morrison, Vice-president and chief appraiser of Cross and Brown Company, New York, lectured at New York University on February 24, in a course on real estate appraising. His subject was "The Valuation of Industrial Property — Designed for Special Use."

Arthur S. Douglass died on March 6 in Detroit. He was construction engineer for the Detroit Edison Company.

Harry A. Rapelye of Kansas City, formerly business manager of Continental Can Company, Inc., was appointed head of the nickel branch of the Office of Production Management some months ago. He is now serving with the War Production Board.

The following changes of address have been received: Maurice E. Allen, 3355 Wilshire Boulevard, Los Angeles, Calif.; Monroe Ames, 1165 Delaware Avenue, Buffalo, N.Y.; G. Temple Bridgman, Metals Reserve Company, Washington, D.C.; Mrs. Ruth M. Denny, Post Office Box 774, Reno, Nev.; John T. Ellsworth, 121 Courtland Place, Collinsville, Ill.; Harold P. Gurney, 20 Chapel Street, Brookline, Mass.; Harold H. Howland, 3114 19th Street, Northwest, Washington, D.C.; George D. Whittle, Public Roads Administration, 720 Phelan Building, San Francisco, Calif. — The Alumni Association would like to know the exact addresses of Harry E. Hill, Georgetown, Mass., and Duncan C. Hooker, Hooker Manufacturing Company, Hartford, Conn. If you have any information about these men, please let the Association know. — H. LESTON CARTER, *Secretary*, 60 Batterymarch, Boston, Mass.

1909

The notes this month are written by your Assistant Secretary Paul Wiswall.

A note from Charlie Main, who has been recuperating at Fort Lauderdale, Fla., makes me sure that no pinch hitters will be required after this issue of The Review. Charlie will be back, full of pep, after a most successful convalescence. That's good news!

Kenneth Blood, now a brigadier general, is in charge of nine forts in Boston Harbor, with headquarters at Fort Banks. — Molly Scharff reports that in Washington he met Harry Rapelye, II, '08, who is serving with the War Production Board as chief of the tin section. His right-hand man is our classmate, Bob Keeney, III. Bob has been making an excellent recovery from an attack of pneumonia.

Art Shaw, in a newsy letter, says: "My firm, Metcalf and Eddy, has been very busy for many months on various projects, most of which have had to do with national defense undertakings, such as airfields, TNT plants, and also our usual line of municipal problems in communities which find their utilities overtaxed by the growth of defense plants. — Thus far, I have kept out of uniform. It looks as though my service in the Army will be by proxy. My elder son, Dick '35, has recently been called to active duty as a first lieutenant in the Corps of Engineers; and my younger son, Bob, who will be graduated from the Institute this year, is scheduled to enter Harvard Medical School on July 1. He will be commissioned in the Medical Reserve and will doubtless be called to active duty immediately after he finishes the intensive three-year course into which the usual four years of medical school are now being packed. — My path crossed that of John Willard on various occasions recently. Twice I met him while having breakfast in New York and once in a hotel in Charleston, S.C., where we both have had jobs to visit. I know nothing more pleasant than to meet a familiar face in a strange city."

Among my intimates I have confessed that I hoped, when I retire and if there is anything left of me, that I might go back to Java for at least a year or two. My Dutch friends have told me that they felt sure my plan could be carried out. As I write these notes, I cannot be too sure. One of my best friends here in New York is a Dutchman whose wife was born in Java, the daughter of a country doctor who left Holland to settle in a small town far from any big city. That little town on the north coast of Java has been in the papers too much lately. It is spelled in the Dutch fashion as Indramajoe, but our papers have Anglicized it to Indramayu. It is, of course, the place where the first Jap expeditionary force got a foothold in Java. Knowing so well the beauties of that matchless island and the serenity of those coast towns, I shiver when I think of what is going on among the placid Dutch and the peaceful Javanese natives. This is particularly so when you realize that Java is about as big as New York State, and on that island, in peace and quiet, have been living almost forty million contented people.

Next to the magnificent mountain scenery, I think the most vivid mind-picture I have of Java is people walking — contented, smiling, happy people walking to and from the villages where their living centers. If you think I exaggerate the benevolence of Dutch rule, I can ask when you have seen any stories of uprisings in Java. The manager of an excellent hotel in the important city of Djocjakarta in central Java once told me what an unusual stroke of fortune it was that the Dutch came to Java. They had been struggling against the sea ever since earliest days, and when they came to Java they found natives who had been planting rice on hillsides and using irrigation projects for centuries. Of necessity both peoples were hydraulic engineers of rich experience. The Dutchman's comment was, by inference at least, "No wonder we get along with the people of Java!" — CHARLES R. MAIN, *Secretary*, 201 Devonshire Street, Boston, Mass. *Assistant Secretaries:* PAUL M. WISWALL, MAURICE R. SCHARFF, New York; GEORGE E. WALLIS, Chicago.

1911

Spring has just sprung as these notes are being prepared, and we are at the start of the third Alumni Fund campaign — an excellent time for us to consider what '11 has done in the first two campaigns and what we should do in the one just starting. In the initial year of the Fund, we had 130 subscribers at an average of exactly $10 per subscriber, while in this second year just closing we have 139 subscribers at an average of just under $11 — $10.95, to be exact.

That's rather a healthy showing for these first two years, but if we are to do our share as a Class, we should try to increase our subscribers by at least one-third and our average subscription by a similar amount, which would give us 185 out of 385, subscribing $14.60 each — almost up to the goal, set by the Alumni Fund Committee, of 50 per cent of the Alumni contributing an average of $15 each. There is the pattern, mates, so please see that YOU fit it!

That you may again see the distribution of classmates geographically and how response to the Fund spreads, we are presenting herewith statistics for Fund II: Greater Boston, 36 of 90 (40 per cent); balance of New England, 19 of 65 (29 per cent); metropolitan New York, 25 of 52 (48 per cent); balance of New York and New Jersey, 4 of 22 (18 per cent);

1911 Continued

Middle Atlantic, 11 of 37 (30 per cent); Southeast, 6 of 10 (60 per cent); Middle West, 23 of 50 (46 per cent); Southwest and West, 6 of 35 (17 per cent); territories and foreign, 9 of 24 (38 per cent). The total is 139 of 385 (36 per cent). Four further breakdowns for states with more than 11 from our Class show: Illinois, 8 of 16 (50 per cent); Ohio, 6 of 17 (35 per cent); Pennsylvania, 4 of 14 (29 per cent); and Washington, D.C., 4 of 18 (22 per cent).

Hats off anew to George C. Kenney, who was upped from brigadier general to major general in February. Here's word also of a junior '11 promotion — Russell T. Werby '41, son of Ben Werby, VII, advanced from second to first lieutenant in the Chemical Warfare Service at Edgewood Arsenal, Md. Please remember to "Write to Dennie" whenever you have any news of classmates, their sons, or daughters in the service.

Jim Campbell, I, thoughtfully sent me a reprint of an article by his partner, Mortimer Freund of Eadie, Freund and Campbell, 110 West 40th Street, New York City, entitled "Heating Fort Greene Houses." The article describes this largest of all government housing projects on the historic site of the Battle of Long Island (Revolutionary War) in Brooklyn. Jim's firm is one of three consulting engineering firms involved in the design of these very modern houses, scheduled for completion in 1943. The article appeared in the February issue of *Heating and Ventilating*. Write Jim if you'd be interested in receiving a copy.

Fred Daniels, VI, Worcester industrialist, celebrated St. Patrick's Day in a rather unique way. He was fined $2.00 for failing to observe a boulevard stop sign. Tsk, tsk! Another laugh in the Worcester *Telegram* recently came from the headline, "1911 Enemy Aliens Now Registered." Need we add that the 1911 referred to the total enemy aliens registered locally to date?

Trust a party by Bill Coburn, I, and his wife, to be different. In mid-March they held a "scrap tease" party. An advance story in the Boston *Post* said: "The party will be held by Mr. and Mrs. William H. Coburn at their Chestnut Hill home, and the socialite guest list will be expected to bring any type of junk sought in the current salvage campaign, depositing at least 25 pounds of old metal, rags or rubber on the lawn for the hosts to have cleaned up and donated to the United Service Organization of Newton."

We have a couple of new addresses: Beardsley Lawrence, I, 83 Myrtle Street, Boston, Mass., and Lester A. Stover, II, 1915 Queen Avenue, North, Minneapolis, Minn. — A final thought: As class agent your Secretary is mighty proud of '11 and its showing in the first two years of the Alumni Fund, *but* remember we want one-third more '11 men contributing one-third more than our present average of about $11. As you meet or write to classmates, ask 'em if they're getting The Review. If they are, they're Fund supporters; if they aren't, urge 'em to subscribe to the Fund and thus get The Review for 1942 to 1943. Thanks! — ORVILLE B. DENISON, *Secretary*, Chamber of Commerce, Worcester, Mass. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford, Mass.

1914

Lyle M. Richardson, Jr., '41, son of our classmate Cap Richardson, was married recently to Nancy Boyle of Reading, Mass. Young Richardson is now a lieutenant on active duty with the Army. Cap has a second son who is now a freshman at Technology. Also a freshman at the Institute is William Bommer, son of Fred W. Bommer. Several other sons of '14 are in either the Army or Navy. Howard A. Morrison, Jr., is a lieutenant of artillery and is serving with an anti-aircraft battery. No small number of our classmates themselves are in the service. Most of them are members of the regular Army or Navy. — The March 4 New York *Sun* carried a picture of Ed Wente perched high on the Manhattan Bridge in New York, where he was conducting tests on a huge air-raid siren.

The third campaign for the Alumni Fund is now getting under way. The average necessary to make up the quota from classes out from 25 to 30 years is approximately $25. Remember that these annual campaigns replace the former occasional drives for larger sums and also that the first $5.00 replaces the former alumni dues and subscription to The Review. Thus a $25 contribution actually is only a $20 gift to the Institute. These funds are capital funds and are not used to meet any current operating deficits should such occur. They are for endowment, additional recreational facilities, and other necessary extracurricular needs which change a college from simply a grindshop to a well-balanced institution. When Ross Dickson, who is handling the drive for '14, writes you, we know you will respond generously in accordance with your ability to contribute. Those who have become life members of the Alumni Association automatically have their Fund contributions increased by $3.00. — H. B. RICHMOND, *Secretary*, General Radio Company, 30 State Street, Cambridge, Mass. CHARLES P. FISKE, *Assistant Secretary*, 1775 Broadway, New York, N.Y.

1915

Never let it be said that '15 wasn't "there"! Technology has asked little of us, but in the permanently and regularly established Alumni Fund we have a splendid opportunity to show our gratitude to the Institute. We have to increase our total for 1941–1942 about 40 per cent to make our quota in the Fund. I feel that men who have given sizable checks in the past will again give just as generously. I am most interested in raising the smaller contributions up to $15, which is the average we need from every man. Do your bit and give to the Alumni Fund.

String Hill, from Hartford, procrastinated beautifully and then wrote an amusing letter in the form of answers to my dues appeal. Burr Swain oddly enough wrote the same kind of letter, in which he says that he wouldn't like to be the Class Secretary but compliments me on collecting dues so nicely and painlessly. About himself he says that he has the same weight, 17 less hairs on his head, and that his son and daughter are old enough to be off the income tax sheet. He has just started on his second 50 years, so says he will have to watch his conduct.

San Willis, White Plains, N.Y., writes: "Have been busy these past few months and home has become nothing more than a place where I sleep one night every two or three weeks. . . . In spite of my travels on defense business, my contacts with '15 men have been few indeed. In fact, the only member of our Class whom I have seen recently is Charlie Williams, who grabbed my arm as I left the White Plains station one day. All others must have hibernated. At least they have kept out of my way very successfully. I hear that Frank Parsons is now with the Reynolds Metals Company, and I understand Don Perin is going great guns with Hamilton Propeller division of the United Aircraft Corporation. I have been looking forward to seeing Jim Neal when he is in New York because sometimes I need plastic items, but so far I have had no word from him. . . . I left the British last September and since that time have been implementing the technical and subcontract sides of the Willys-Overland defense program. With over 50 subcontractors and about the same number of individual items to look out for, I am kept on the jump, and the future looks, if anything, busier than the past."

Phoebe Proctor, of Salisbury, N.C., writes: "I see very few of the M.I.T. boys down this way and hear very little about them. I seem to be behaving myself fairly well of late, but I guess that if you will refer to my date of birth you will find the explanation for my good behavior. I am operating a comparatively small chemical company, which I started in early 1938. Am doing well and increasing the business, although I could not pass as a bloated plutocrat. Have reasonable hopes for the future. In case you are interested in personal details, my wife and I are still living together, which may seem a great surprise to you, as it must reflect an exceptional ability on her part. We have two daughters — Judy, 18, who is at Woman's College of the University of North Carolina; and Patsy, 14, who goes to high school in Salisbury. Both are blondes and considerably better looking than their old man. I should appreciate any personal news about the boys in our Class."

Denny '11 from Worcester, Mass., writes to "Help Azel" with a news clipping about our own Marshall Dalton, who was recently elected president and treasurer of the Worcester Manufacturers Mutual Insurance Company. Congratulations and best wishes to Jack in his new job.

A recent Boston paper carried a picture of our good-looking class baby, Virginia Thomas of Brookline, Mass., a member of the hospitality committee for the

1915 Continued

annual assembly held in Boston by the Junior Daughters of the American Revolution in March. Her mother, Barbara Thomas, helps Azel by notifying me that Robert C. Casselman '39 and Mrs. Casselman of Newton Center have a daughter. This makes Bridge Casselman of our Class a grandfather.

Another class grandfather I know is Weare Howlett, whose daughter Betty recently had a son. Time marches on for these older members of the Class.

From the grab bag of the many letters received with class dues, I pull out one from our erudite and humorous bacchanalian raconteur, St. Elmo Piza: "It isn't that I mind your exercising your just prerogative in asking for class dues, but at least you might enclose a good story or two just so I could be sure that ye ain't changed a bit and be satisfied that you are really going to buy that set of red plush curtains to make the girls happy up at the old class headquarters, instead of giving it all to a charity as I thoroughly feel you will. . . . At the moment I am busy as I have not been for years. No longer master of my fate or master of my soul, I have joined the ranks of the socially secure, or at least that is what my card says, in doing government work." St. Elmo goes on from there to tell something about his work, and he sounds like the same jolly person he always has been at our class parties. — Remember the Alumni Fund. — Give! — AZEL W. MACK, *Secretary*, 40 St. Paul Street, Brookline, Mass.

1916

Steve Brophy and his family spent a month in Florida recently. Just why Steve should need this sunshine treatment is hard to understand. We have always thought that the advertising business provides its own relaxation.

Nelson MacRae died on February 10 at Wilmington, N.C. Those at the reunion last June will recall that we were seriously considering a reunion meeting at Nelson's hotel resort in North Carolina. Nelson left his wife and two children — a son who will be graduated from St. Paul's School in June, and a daughter about 10 years of age. His father, Hugh MacRae '85, also survives him, as well as his mother and a married sister.

Nelson will be missed by his classmates. He was a sincere and loyal friend, a great companion, and a devoted husband and father. Steve Brophy writes that he saw him about three months prior to his death. Nelson was on his way to visit his son at St. Paul's, and he was bursting with pride for the accomplishments of his son, who was captain of the famous hockey team at St. Paul's and otherwise prominent in the school. — JAMES A. BURBANK, *Secretary*, The Travelers Insurance Company, Hartford, Conn. STEVEN R. BERKE, *Associate Secretary*, Coleman Brothers Corporation, 245 State Street, Boston, Mass.

1917

If the original plans for the reunion have been changed, you will have heard from McNeill or one of his corps of assistants. Early in March there was an extended discussion with one or two members of the Class who raised the question of whether omission of the reunion would not be a desirable gesture. On careful consideration, it was the almost unanimous opinion that such a gesture was without sound purpose and would accomplish nothing, whereas the reunion itself might be directly beneficial. At that time over 100 men had indicated that they planned to attend unless something unforeseen developed. As other class news pales beside the reunion notes, we have asked McNeill to give us a few comments. Call it a pep talk if you will. If it serves to bring only one additional member to the reunion, it will have been well worth while.

McNeill writes thus: "At this date, it seems a certainty that the Griswold Hotel, Eastern Point, New London, Conn., will open its season by entertaining the Class at its 25th reunion on June 5, 6, and 7. The nearness of the submarine base at New London and the possibility of coastal attack by submarines or airplanes should add a little zest to the reunion. The manager of the Griswold told me on the telephone that he may even arrange a fishing trip for those who do not mind being torpedoed. The golf course is about one block from the hotel, and tennis courts are on the property. If the weather is warm, you can put on your bathing suit and sun yourself in one of the easy chairs around the swimming pool. Do not miss the chance to meet your classmates and learn what they are doing in the world." — Allen F. Kingman, a colonel in the Army, has left Washington and is now at Fort Benning, Ga., in command of the 67th Armored Regiment of the famous 2d Armored Division. Allen wrote to say that he's sorry he can't be with us at the reunion. — RAYMOND STEVENS, *Secretary*, 30 Charles River Road, Cambridge, Mass. PHILIP E. HULBURD, *Assistant Secretary*, Phillips Exeter Academy, Exeter, N.H.

1919

The 1941–42 Alumni Fund drive closed March 31, and the 1942–43 Fund collection is now under way. As of February 15, 70 per cent of the '19 quota of 166 contributors for 1941–42 had been reached, and 33 per cent of the money quota of $2,985 obtained.

The average contribution has been projected at a $15 net average from each Alumnus. This coming year members of the Class are urged to increase the size of their contributions so that the goal set by the Alumni Fund Board may be reached. The cost of The Review and of operating the Association and the Fund all amount to about $5.00 per contributor, so the contribution above this amount is the money which is a direct benefit to the Institute. The average contribution from our Class was $8.40 a person for the last year. Let us all work towards increasing the number of contributors as well as the average amount given for the coming year.

The present global war has made many changes for all of us. Dr. Marshall C. Balfour has returned to the United States from Manila, P.I., and is now at Rockefeller Foundation, International Health Division, Room 5500, 49 West 49th Street, New York, N.Y. We look forward to seeing Bal one of these days.

Ted Shedlovsky, 3941 48th Street, Sunnyside, Long Island, N.Y., reports that he is carrying out research on solutions and physical chemistry in biology and medicine. He writes, "There is a war to be won, so the work is taking a shift of angles." Ted is vice-president of the New York Academy of Sciences. He has two sons and a daughter; the oldest is a junior air warden but has leanings toward the Navy. Ted has contacted Lester Wolfe, a lieutenant commander in the United States Navy, and Ben Coleman, Secretary of the New York Tuberculosis and Health Association. Ted queries: "How about lunch with me, Gene? Just call Regent 4–8000 and say you're coming." Ted's hobbies are chess and music. — Dave Sanford, Jr., writes from High Ridge Road, Stamford, Conn., where since the beginning of 1940 he has been continuously active in large-scale housing. Currently he is working on a defense project in Bantam, Conn. Dave has two boys, 13 and 8. — Edward L. Sache, 51 Sawyer Avenue, Dorchester, Mass., is a chief machinist's mate in the United States Navy. He was with the American Can Company of Massachusetts for a long time but was called to active duty.

Morton A. Smith writes from 21 Brainard Avenue, Great Barrington, Mass., where he is in sales and service work for radio and appliances. Morton has a wife and one 10-year-old daughter. He is secretary of the Independent Order of Odd Fellows, a Royal Arch Mason, and a Rotarian. — Edward M. Sherman writes from 11 Maurice Road, Wellesley, Mass., where he is manager of the real-estate department for the Warren Institution for Savings, Boston. He is married and has no children. Sherman's hobby is taking care of his yard, particularly the shrubs and wild flowers. He travels little but is desirous of doing more. While he has seen some members of other classes, he has not met any classmates recently.

Albert B. Reynolds, 92 Hillcrest Avenue, Morristown, N.J., writes that he is an engineer in the Bell Telephone Laboratories, Inc. Albert is married, has no children, and spends time in his garden. He has contacted the Bell Telephone Laboratory men of our Class, does little traveling, has "a few headaches and some gray hairs," and has not seen Tech since September, 1918. — Margaret Pierson Olfene, 32 Intervale Street, Lynn, Mass., is a Gage Laboratory worker for the Boston Ordnance District. She is married and has a daughter 15 years old. Her diversions are hiking, reading, and conversation. — Mrs. Charles R. Park, R.F.D. 2, Cuyahoga Falls, Ohio, writes that her husband passed away on December 11 from the effects of a storm-sewer explosion near Firestone Park, Ind.

1919 Continued

Kenneth Pike writes from 2410 Speedway, Wichita Falls, Texas, where he is an agent for Phillips Petroleum Company. Kenneth is married, has no children, spends his time taking amateur movies, and has taken a trip to Mexico and the Caribbean countries. He saw Ezzy Paterson in New York on a trip several years ago. — Webb Patterson, Box 349, Waltham, Mass., gives as his home address The Melcher, Waterville, Maine. His work has been in hospitalization. He has written a privately published book, *The Epigrams of Patristocrat*. His hobbies include puzzling, philosophy, poetry, and epigrams. His travel consists of flights of fancy. His pursuits are puzzle publications and contributions of incidental verse to newspapers and other publications, written under the name of "Archie Tech."

Charles M. Herrick is with the Georgia Power Company, Albany, Ga. Charles T. Kennedy lives at 870 Ridgeway Avenue, Cincinnati, Ohio. Ralph M. Silloway has moved from New Orleans, La., to 368 High Street, Newburyport, Mass. Harry Stiller resides at 69 Richmond Street, Providence, R.I. — It is interesting that the Class has three sons who are freshmen at the Institute: Harry A. Kuljian's son, Arthur H.; Milton A. Loucks's son, Charles P.; and Timothy E. Shea's son, Paul E. — EUGENE R. SMOLEY, *Secretary*, The Lummus Company, 420 Lexington Avenue, New York, N.Y. — GEORGE W. MCCREERY, *Assistant Secretary*, 131 Clarendon Street, Boston, Mass.

1920

No doubt the most exciting news in these notes is that of the Valentine's Day wedding of Dan Hennessy to Louise Hamilton Maguire, daughter of Mr. and Mrs. Edward Francis Maguire of Scituate and Newton. I am sure every member of the Class joins me in extending congratulations to Dan, who is a prominent citizen of Brookline, Mass. He and Mrs. Hennessy are residing at 66 Risley Road. Among the ushers at this notable wedding was Buzz Burroughs.

We understand that no little excitement has been stirred up around Rochester, N.Y., as a result of a prominent news report in the Rochester *Democrat and Chronicle* on a father-and-daughter banquet held at the Columbia School in Rochester. Several fathers who, according to the paper, had made names for themselves on the football squads of their alma maters, appeared in full football regalia to review their past glories on the gridiron. Among this selected group of football heroes was mentioned Edward Farrow of M.I.T. We understand Ed has been receiving congratulations from all loyal Tech men in the vicinity. Your Secretary can't seem to remember how many touchdowns Ed made for the glory of M.I.T., but it is certainly nice to know that we had a famous football star.

We hear very good reports of Jack Coyle and the fine work he is doing at the Bullard Company, machine tool manufacturers in Bridgeport, Conn. Jack is now one of the top executives there. — Charles J. Muller, a geologist for the United States Steel Corporation in Pittsburgh, sailed recently from New York for South America to visit some of the mining country. — Igor Zavarine, until recently an Assistant Professor of Metallurgy at M.I.T., has gone to Washington, where he is in the Bureau of Aeronautics of the Navy Department.

Ed Cruise has left New Jersey and is back around Boston, at 68 Washington Avenue, Winthrop. — Don Ferris has left Kansas City and is living in Tarrytown, N.Y., at 5 Wood Court. — Erwin Harsch has moved from Chattanooga to 3107 East Fifth Avenue, Knoxville, Tenn. — Wendell Sammet is now a lieutenant colonel, stationed at 3821 V Street, Washington, D.C. — Ted Hobson's new address is 19 Bonwood Street, Newtonville, Mass. — Bob Turner is with the Western Cartridge Company, East Alton, Ill. — HAROLD BUGBEE, *Secretary*, 7 Dartmouth Street, Winchester, Mass.

1921

The third year of the Alumni Fund began with the appeal that went forward to you all last month. Mail your contribution at once so there will be no lapse in your subscription to The Review. Remember, the goal is a $15 *average* and that only the excess over $5.00 in each contribution actually benefits the Institute itself. Please save mailing costs and paper by contributing right now.

John W. Barriger, 3d, XV, is again in the national spotlight as these notes are prepared. President Roosevelt ordered Joseph B. Eastman, director of the Office of Defense Transportation, to take control of the strike-ridden Toledo, Peoria and Western Railroad Company. Mr. Eastman immediately appointed John, who is his associate director, as the Federal manager of the road, with offices in Peoria, Ill., under the Presidential order "to assure successful prosecution of the war." John, with eight assistants, has begun operation of the vital Midwest line.

John returned to Washington following his recent resignation from the Western Carriers Conference Committee of the Western Association of Railway Executives. In thanking the Class for its courtesy to his eldest son, John W., 4th, at the Institute's Alumni Day '41, John wrote the following: "Mr. J. B. Eastman and his director of the Division of Railway Transport paid me the compliment of inviting me to join the staff as the latter's associate. I was quick to avail myself of this unusual opportunity to take an active part in the work of this new organization which will co-operate with all agencies of inland transportation to make maximum capacity available for the duration. Fortunately I had not given up my house in Washington or it might have been impossible to return."

John began amassing his wealth of railroad knowledge before and during our Institute days while working for the Pennsylvania Railroad. After graduation he was employed by Kuhn, Loeb and Company and collaborated in formulating the Prince plan of railroad consolidation. Later he became chief examiner in the railroad division of the Reconstruction Finance Corporation. Besides son John, who says he is going to be a '49 man at the Institute, the Barriger family includes Elizabeth, twelve; Ann, ten; and Stanley, seven.

Howard L. Vickery, XIII-A, a rear admiral, is vice-chairman of the United States Maritime Commission and appeared on the national scene as the principal speaker on a broadcast of the Mutual Broadcasting System on March 9. Introduced by the chairman of the American Forum of the Air in Washington, Howard pointed out that, while only two cargo ships had been built in the United States for overseas trade in the 14 years prior to 1937, eighteen million dead-weight tons of such vessels will be delivered from now to the end of 1943. Twenty-eight ships were delivered in February, a like number slid down the ways, and twice as many new keels were laid, in order that two ships per day can be delivered by midsummer. He closed the broadcast by quoting a slogan seen on a shipyard crane, "The guy who relaxes is helping the Axis."

J. Rowland Hotchkin, II, is president of the Palnut Company, 61 Cordier Street, Irvington, N.J. While his hobby is still music, Hotch now prefers the song of machinery which turns out the widely used vibrationproof lock nuts of many types which are offered by his company. — Everyone will be glad to know that Ray St. Laurent, X, has left the sick bay and is back tossing them over the plate for the Rogers Paper Manufacturing Company. — Philip T. Coffin, VI-A, our Glen Ridge neighbor, has been elected president of the Linden Avenue Home and School Association, Glen Ridge, N.J. Phil is with the Aluminum Company of America at their offices at 230 Park Avenue, New York City.

I talked with Victor C. Hassold, II, on March 21. To most of us that day is simply the beginning of spring, but to Vic it is the birthday of his triplets, Bob, Dick, and Peg, who are now 13 years old. Vic has been with the Steel Heddle Manufacturing Company, 2100 West Allegheny Avenue, Philadelphia, since 1921. He is superintendent of the company. He wants to hear from Whitney Wetherell, II, who is reported to be with the Carrier Corporation. — Also talked with Dugald C. Jackson, Jr., VI-A, a major in the Ordnance Division, who is stationed at Frankford Arsenal, Philadelphia. Dugie has one boy completing his work at Northwestern and slated to do graduate work at M.I.T. or Annapolis, after which he will receive his commission as ensign. The second boy is a crew coxswain at Yale. Dugie reports that he is executive officer for production and manufacture and that Franklin Mitchell, X, is executive officer for procurement at the arsenal.

Frederick W. Adams, X, is senior industrial fellow at the Mellon Institute, Pittsburgh. He is in charge of fellowships for the Pittsburgh Plate Glass Company. Fred has two sons, Frederick, Jr., 15, and

1921 Continued

Noel, 10, who are aiding and abetting his sailing activities. — Robert F. Miller, XV, now sports a professional card in The Review. He is with the management engineering firm of Stevenson, Jordan and Harrison, Inc., 19 West 44th Street, New York City, with offices in Cleveland, Chicago, and Montreal. Bob's work includes cost reduction, production planning, wage incentives, budgetary control, sales, and financing. He started out as an industrial engineer at the Pfaudler Company, then became industrial secretary of the Rochester Chamber of Commerce before joining the New York firm. Bob's avocation is photography, particularly colored movies. We hope those he made of the Class last summer will be half as good as the swell shots he has of his three youngsters, Margaret, Robert, Jr., and Elizabeth, who are respectively seven, five, and four years old.

Miles M. Zoller, XV, is vice-president and general manager of the Eagle Picher Lead Company, Temple Bar Building, Cincinnati, Ohio. Miles has been with this organization since graduation, coming up through sales to sales manager and then to manager of the pigment division. He has three sons, Miles, Jr., eighteen, James, fifteen, and Albert, six. Of his many varied activities, Miles confesses that golf still tops the list. — Willard G. Loesch, III, is another golf fiend who is supplementing his divot digging with a victory garden for the duration. Bill is vice-president in charge of production with Forbes Varnish Company, Cleveland, Ohio. Out at 107 Kensington Oval, Rocky River, Ohio, where the Loesch homestead is located, Robert, 13, and Norma, 10, supplement the garden work by collecting defense stamps.

Arnold R. Davis, X, is director of the rubber laboratory of American Cyanamid Company, Stamford, Conn., where he has been located for the last six years. Prior to that he was plant superintendent for the United States Rubber Company and chief chemist of Firestone Footwear Company. He is married and has four children — Leland, fourteen, Norman, thirteen, George, nine, and Martha, two. The Davis home is at Lockwood Road, Riverside, Conn. — Maurice G. Townend, XV, has been with the Parks-Cramer Company since ten days after graduation. He's been in just about every department of the textile business. He is now supervisor of production as the Charlotte manager and makes his home at 2208 Croydon Road, Charlotte, N.C. He has two daughters, Jane and Judith, respectively five and three years old. Music, golf, and photography take top honors for recreational activities.

New addresses for the month include: Brigadier General Harvey C. Allen, Camp Hulen, Texas; Henry P. Harris, I, 310 Sumner Boulevard, Collinsville, Ill.; Colonel Mark L. Ireland, Quartermaster Corps, Headquarters First Corps Area, Army Base, Boston; A. Warren Norton, XV, 110 Pickwick Road, West Newton, Mass.; Hugh D. Seaver, IV, 2440 Overlook Road, Cleveland, Ohio. — When you put down this issue to mail in your response to the Fund appeal, include a news note for your Secretaries. — RAYMOND A. ST. LAURENT, *Secretary*, Rogers Paper Manufacturing Company, Manchester, Conn. CAROLE A. CLARKE, *Assistant Secretary*, International Telephone and Radio Manufacturing Corporation, 67 Broad Street, New York, N.Y.

1922

At the date these notes are written, the reunion plans have progressed to a point where notices of the time and the place — June 5, 6, and 7, Sheldon House, Pine Orchard, Conn. — have been mailed to all members of the Class. To the first mailing the response as of March 23 was as follows: 144 replies, of which number 42 will be on hand full time and 17 part of the time; 55 definitely cannot attend; and 30 wish to be kept posted. This is a fine response and indicates that we may expect a substantial attendance. Further information, giving the details of cost, transportation, and so on, will probably be in the mail before these notes are read.

Clate Grover has just made a trip to the Pacific Coast, and while there saw H. Richard Aaron, now a lieutenant, who is stationed in San Francisco, where he is supervisor of ships at the Bethlehem Shipbuilding Company. — Clate also reports that John Nichols, who gained wide experience in the production, use, and distribution of tin plate while he was with the American Sheet and Tin Plate Company in San Francisco, has been called to Washington by the War Production Board. He is in the tin plate unit, productions section, iron and steel branch. — Another classmate seen by your Secretary was Marion Banks of the Southern California Gas Company, Los Angeles, who commented quite truly that the appointment of men like Nichols to the War Production Board is indicative of the high caliber of men who are sacrificing their private affairs to promote the war effort.

The March issue of The Review had a very fine picture of Dunc Linsley on page 229, in connection with the report of his nomination for term membership on the Institute's Corporation. — An announcement in the *Textile World* of February states that Edward E. Palmer, district supervisor of textile activities in the Boston office of the General Electric Company, has retired and that "he has been succeeded by G. D. Godard, who has been his assistant since 1935. Mr. Godard was graduated from M.I.T. in 1922 and was transferred to the Boston office staff after working in the West Lynn and Schenectady plants." The Class will have General Electric under control yet, with Dewey moving up and with Don Walch in charge of the Providence office. Congratulations to you both.

Don't forget the reunion dates — Friday, June 5, to Sunday, June 7, at the Sheldon House, Pine Orchard, Conn. — CLAYTON D. GROVER, *Secretary*, Whitehead Metal Products Company, Inc., 303 West Tenth Street, New York, N.Y. C. YARDLEY CHITTICK, *Assistant Secretary*, 77 Franklin Street, Boston, Mass.

1923

Clarke C. Miller reported that he and his family have moved into a new home in Wood River, Ill., where he is near his work with the Standard Oil Company of Indiana — sufficiently close, he says, so that tire shortages do not worry him much. He says he occasionally has the opportunity of attending meetings of the Technology Club of St. Louis.

Jack Keck reports that one Sunday afternoon in March he and his wife had the pleasure of entertaining Charlie Roche, his wife Vera, and their pride and joy, Peter, who is two years old this month. Charlie is a department head at Merck and Company, Inc., in Rahway, N.J.

John W. Beretta wrote in February from the Newfoundland Base Command: "Last summer I became convinced that our entry into the war was inevitable and decided to get into the Army. After arranging my business interests and turning their active management over to my associates, last July I entered the United States Army Air Corps as a captain. My first station was Randolph Field, Texas, where I served as engineering officer of the Gulf Coast Air Corps Training Center. In September, I was offered a chance to proceed to Newfoundland, where I am now serving on the general's staff as senior aide-de-camp and as engineering officer of the air staff of the Newfoundland Base Command." Beretta was with a leading consulting engineering firm in San Antonio.

Bill Vicinus, from Rochester, N.Y., turned up recently in Bay City, Mich. He explains: "Last January I left the firm of Whitmore, Rauber and Vicinus and started to look for a new business enterprise. In October, I ended up here in Bay City running a gypsum quarry. We are a small organization and plan to quarry and crush about 80,000 tons a year for the admixture for the cement industry. The plant is located at Turner, Mich., and is known as the Turner Gypsum Company. Inasmuch as I had two daughters, both in high school, the living problem was difficult. Turner's population of 125 included the babies. We have a nice house here in Bay City, and while it means driving 45 miles each way, the roads are good and the girls like their school. I have a son in the fourth form at St. Paul's School in Concord, N.H. He plans to be a Tech man. We also have a little girl, who is 2½ years old. I like my new work very much, and we have an excellent priority rating. There is considerable demand for our product, and I am looking for new outlets."

Kibbe Turner is mentioned as follows in a December issue of the Charleston, W.Va., *Mail:* "R. K. (Check) Turner, superintendent and top man at the South Charleston Carbide plant, was elevated to his present post in June, 1940. A native of Newton, Mass., and a chemical engineering graduate of the Massachusetts Institute of Technology, Check joined Carbide in 1924 going to the first plant operated in this area at Clendenin. He went to South Charleston in September

1923 Continued

1925 after the company purchased the old Rollins chemical plant. He married a Boston girl and the couple has five children."

There have been recruited in recent months something over a million civilian defense workers who will have assignments as auxiliary firemen. Someone had to write a book on how to train them. That's what I was doing when the notes were due last month. — HORATIO L. BOND, *Secretary*, 457 Washington Street, Braintree, Mass. JOHN M. KECK, *Assistant Secretary*, 207 Bloomfield Avenue, Bloomfield, N.J.

1924

Many members of the Class have been on the move during recent months, largely as a result of the war. Jimmie Doolittle has left St. Louis for the Army Air Corps at Washington, D.C. Bill Sturdy has moved from Fort Monmouth, N.J., to the Office of the Chief Signal Officer at Washington, D.C. Marshall Waterman, formerly in Poughkeepsie, is with the War Production Board, 4th Street, Southwest, Washington. Also in Washington is Francis B. Robins, formerly in Richmond, Va.

Tom Mattson moved during the winter to Milwaukee, Wis., where he is located at 2435 West Wisconsin Avenue, and is long overdue on a report on his activities. Among other moves were those of Leo Grossman from Bar Harbor to Malden, Mass.; Newell Waters from Corpus Christi to Weslaco, Texas; and Lucy Sikorsky from Plaistow to Campton, N.H. News from all these men would be welcome.

Don Moore, according to a letter from our faithful correspondent Bill Correale, is on active duty as a captain in the Coast Artillery Corps and is stationed at Galveston. Jim Metcalf was married in January to Veida Stella Morrow, and they are living in Seattle, Wash.

Our Class was well represented on the committee for this year's Alumni Dinner, with Del Kendall as chairman and Bert Stewart as a committee member. On the publicity committee was Chick Kane, who also designed the stein for the dinner. — FRANCIS A. BARRETT, *General Secretary*, 50 Oliver Street, Boston, Mass.

1925

The other day I received from Count Blonsky that answer to a Class Secretary's prayer, a solid two-page letter. With this in hand, I know that Doc Foster will forgive me for using the source material direct and for by-passing his note telling of Blonsky's recent history. Here is the letter practically as I received it from George and his wife Lotte: ". . . Since we had our last contact with you, the Blonskys have gone through a kaleidoscope of jobs miserable and worse, a world of geography, and bushels and bushels of grapes of wrath. Things were going a little too fast for both of us during the last six months especially, what with floods, 22 miles of walking through the cactus hills of Arizona with suitcase in hand, having three jobs explode in our faces and, mind you, all in one week, two major operations in a month, airplane flights from Phoenix to San Francisco and back and then again to Seattle, with a little 1,000-mile week-end drive to El Paso, Texas, thrown in during the same week — all this had to be topped by a $300 and all-expense job in Alaska, which terminated abruptly on the sixth day in Juneau, when the Japs bombed Pearl Harbor. . . .

"Tribulations and calamities became so much of a habit with our family that even our Ferdinand, the pooch, decided that he should pitch in and demand a tonsillectomy. Mrs. Blonsky was in the hospital recovering from her operation when I started for Alaska. It was a grim decision, but the force of circumstances prohibited any other course. We thanked the Japs for George's sudden return and an unexpected Christmas together. As Lotte improved, George went on a further job hunt and had a couple of jobs lined up, when, like a thunderclap out of a clear sky, an offer came from the M. A. Hanna Company of Cleveland, Ohio, of an engineering job at Las Vegas, which promised quite a good salary and also showed all signs of temporary permanence. We believe that in our days, this is the greatest degree of permanence anybody can achieve in a new job. So here we are in Las Vegas, living in one room and a kitchenette for a mere pittance of $107 a month, while we are awaiting the completion of our future home that is being built at Boulder City by the company.

"Las Vegas and surrounding desert are blooming overnight with shacks, tents, trailers, hovels, plain mattresses under the road signs, prefabricated blister abodes, and other imitations of housing facilities. To have a meal in a restaurant, you have to stand in line for about an hour before you can sit down; the same thing applies to the post office, where queues of 40 to a window are a regular occurrence. The shelves in the grocery store are continuously empty, even though the clerks are madly busy throwing cans and vegetables out of the shipping crates and boxes into the general direction of the shelves. The goods are snapped up on the wing and nipped in the bud before the majority of the public can get a good smell of them.

"At this point, Mrs. Blonsky, who is typing this letter, is making some mild objections. She believes that the metaphor tore somewhat loose and has leaped beyond the bounds of actual facts. . . . You know this town is what they call 'wide open.' This means that the bars function 26 hours a day, the drunks stagger by you at 10-foot intervals, the gaming and gambling and the lowest forms of wild life simply run the law-abiding citizen clear out of bounds. . . .

"We go to work every day 27 miles and back in the company car at company expense, and also return home for lunch all that distance each noon. The town doubles its size every six months because of the defense plants. The men are earning fabulous wages, and the roulette wheels operate continuously on red-hot bearings. . . . Most inhabitants of Las Vegas use the slot machines as a form of light exercise to keep themselves and their pocketbooks in trim shape. Every payday our crew goes berserk, and it is up to the engineer to keep away from his telephone as otherwise he would be busy all the time helping his men out of difficulties. . . . This is just an example of the wild West at its best! And of romance at a glance! Wouldn't you love to live in a place like this, and be a part of this Sunday edition of funny pictures yourself?"

We have Obie Denison '11 to thank for the following clipping from the Worcester *Telegram* of February 28: "Two Norton Company executives who will enter the country's service soon, were given a farewell party by about a hundred associates last night at the Town Club. They are Works Manager Ralph F. Gow [XV] who . . . will become an assistant in charge of procurement to Col. James S. Crawford ['23] of the Army's Boston Ordnance District and Manager of Control Francis N. Luce. . . . Both were granted leaves of absence, and are expected to rejoin the company at the end of their service. Mr. Luce was presented a strap watch and Mr. Gow a luggage case on behalf of the gathering by Production Manager Harold C. Dunbar. Mr. Luce has been with the company 21 years, and Mr. Gow 17 years." — HOLLIS F. WARE, *General Secretary*, 3 Aquavia Road, Medford, Mass. F. LEROY FOSTER, *Assistant Secretary*, Room 7–121, M.I.T., Cambridge, Mass.

1926

The Detroit *News* recently carried the following article from Washington about the interesting work of one of our '26 architects, Shep Vogelgesang: "The Government's head house painter has a lot of tricks in his paint pails to knock the monotony out of the rows of dull houses being built for defense workers.

"Shepard Vogelgesang, who makes house painting a fine art, plans the coloring of the 100,000 defense houses in his little studio at the Federal Works Agency. He is called a color consultant.

"Painted white or gray, Vogelgesang observes, the thousands of little dwellings spring up row on row in defense towns, all of them quite plain and very much alike, 'Look rather like a fresh crop of mushrooms.' But Vogelgesang breaks up the long rows of houses with paint. He pushes one back and pulls the next one forward by varied colors. He might do it by painting one slate gray, the next one buff — any combination which will give perspective. Then by working in a third color, and perhaps a fourth, he breaks up the row into small groups of houses.

"Vogelgesang was trained as an architect at the . . . Institute . . . and in Vienna. He has used his eye for color on sets of the Metropolitan Opera Company and he helped glorify Florenz Ziegfeld's productions which glorified the American Girl. He helped also to color the World's Fairs in New York, Chicago and San Francisco. Until recently, he practiced architecture in Whitefield, N.H.

1926 Continued

"To make a long row of houses seem shorter, Vogelgesang will accent one of the end houses with some bright paint, like yellow or red or any color which will give a sudden contrast. His theory is that when you start driving past the row your eye fixes on the accented house toward the end and you feel that you're arriving there more quickly.

"Where houses are grouped in quadrangles or courts, he plots color patterns like a melody. The courts in the defense development at Newton Falls, Ohio, which he is working on now, are a blend of four colors — buff, light tan, brown and gray. . . . Where the regiments of small homes are on hilly land, Vogelgesang accents the natural contours, painting the houses at the top of the hill a light color, those in the valley a darker shade, thus making the hill seem higher and the valley deeper. A recent example of this treatment is the 1,700-unit settlement at Vallejo, Calif., where workers at the Mare Island Navy Yard are housed.

"Vogelgesang employs as much gay color as the dwellers in the houses can take. The idea is to make the towns as interesting looking as possible, to get away from the barracks-like effect, and to make up for the lack of natural trees or shrubbery.

"But a color which is out of place can make endless trouble. Bright yellow, red, pink or green might please you on the outside of your own house, but they might start a feud with your neighbors. Colors like those will throw weird lights into the house next door under some conditions."

A. W. K. Billings, Jr., has recently been promoted to the rank of lieutenant colonel in the United States Army. — Joe Levis expects to be called to active duty as a reserve officer. — Roscoe L. Wood has left Cabin John, Md., to take a job in Rio de Janeiro, Brazil. — Donald S. Nelson, another of our architects, has left Chicago, Ill., and may now be addressed at the Southland Life Building, Dallas, Texas. — Bruce T. Humphreville has moved from New York State to Columbus, Ga. — The address of Arthur C. Fuller, a lieutenant, has been changed from Fort Bragg to the New Orleans Port of Embarkation. — George Smith is president of the Boston Camera Club. In the club's recent international salon two of his prints were exhibited. — JAMES R. KILLIAN, JR., *General Secretary*, Room 3–208, M.I.T., Cambridge, Mass.

1928

Henry B. Dean is still located in Los Angeles. He is working for the Union Oil Company of California and has recently been appointed assistant sales manager. Hennie is keeping active in Institute affairs by serving as secretary-treasurer of the Technology Club of Southern California. Congratulations on your success in both jobs, Hennie!

Franklin McDermott, who for the past several years has been assistant plant engineer for the Lever Brothers Company at Edgewater, N.J., has been transferred back to the home plant of this organization in Cambridge and is now making his home in the town of Winchester. — For the first time since 1936, William Hurst of Dallas, Texas, was in Boston recently to visit his family and the Institute. After graduation Bill was employed by the Humble Oil and Refining Company. He stayed with this company 12½ years, until January 1, when he resigned to accept a position with Core Laboratories, Inc., of Dallas. Bill was in New York recently to deliver a paper before the American Institute of Mining and Metallurgical Engineers on "Water Influx into a Reservoir and Its Application to the Equation of Volumetric Balance."

The General Electric Company at Pittsfield, Mass., has announced the appointment of Max Alimansky as manager of sales for capacitors. Max has been with the organization since 1926, when he started as a co-operative student in Course VI-A. After graduation he entered the capacitors engineering section of the company. In 1931 he was transferred to the transformer division, where he has been connected with the sale of capacitors. In this work he has contacted electric power and industrial companies all over the country, lectured to many groups, and written for various trade journals.

For the past four years Bus Ruch has been working with "weatherman" Krick at the California Institute of Technology, Pasadena, Calif. Bus is now very busy teaching advanced meteorology to air corps pilots and navigators. He has a new twist to the "Hurrah for California weather" advertising, for he now claims that as a result of his technical studies of weather all over the country, he wouldn't live anywhere else! Bus has started a most unusual hobby, the raising of Mongolian pheasants, which, he says, are the best birds one can eat. Through this hobby, he has added a bird dog to his family and taken up hunting on the deserts of southern California.

James Donovan has joined the ranks of proud fathers. Jim has a son, Andrew, born on December 31. All is well with son, mother, and father! Jim is probably one of the busiest men in the Class, working nearly day and night in his capacity as treasurer and general manager of Artisan Metal Products, Inc., a concern which Jim was most instrumental in establishing in 1934 to manufacture equipment for the chemical process industries. — GEORGE I. CHATFIELD, *General Secretary*, 6 Alben Street, Winchester, Mass.

1930

Our congratulations to Gerrie and George Lawson, VI, on the arrival of their first child, George. The Lawsons are skiing enthusiasts and make their home in Marblehead, Mass. — John Moriaty, VI, wrote recently that after ten months at Camp Wallace, Texas, he had been detailed to special duty for the Army at a new post. He told me that Ric Ricciardelli is working with him on the same confidential mission. John's wife and year-old son are with him also. Your Secretary will appreciate a note from any of our classmates in the service, even if we are sworn to secrecy on certain details. — The war news from the Pacific area during the past few weeks indicates that Jack Bennett, our Class President, is in the thick of things in Wahroonga, New South Wales, Australia. His wife and three-year-old daughter Polly are still out there, as far as I know. We all hope sincerely that the invaders won't make any progress there or elsewhere!

A Course X man is a fellow townsman of mine now. Jack Sherman is a supervising engineer at the Quincy plant of the Procter and Gamble Company. Four years ago Jack married Jane Cooper of Wyoming, Ohio, and their daughter, Louise, is two and one-half. He has been in the Cincinnati area since the completion of his graduate year in Course X-A. — John Worcester, XII, is at La Paz, Bolivia, according to Charles E Locke '96, Alumni Secretary. John is working for the United States Bureau of Mines. — PARKER H. STARRATT, *General Secretary*, 1 Bradley Park Drive, Hingham, Mass.

1931

Harold Champlain, our Class President, has returned to the east from California and brought with him a bride. On December 7, Phoebe Matthews became the bride of Harold Perry Champlain at Carmel-by-the-Sea, Calif. Harold, who is assistant to the Vice-president of the United Fruit Company, was formerly located in San Francisco. He is now living at 11 Waverly Place, New York, N.Y. — Harriet Fellowes Bent was married to H. Sheldon Smith in Taunton, Mass., on December 31. Sheldon is manager of the new Sears Roebuck store in Newport, R.I.

From Washington, D.C., comes news of the marriage of Josephine Louise Lutes to George Casgrain Humphreys, a lieutenant in the United States Navy. The last word we had from George told of his transfer from Chicago to Washington on special work for the Buda Company. Since then he has transferred his activities to the Navy and is serving in the Bureau of Navigation in Washington.

Mr. and Mrs. Samuel G. H. Turner of Westover Hills, Montour Falls, N.Y., announced the engagement of their daughter Lucy to Robert Morris Snyder. Bob is in Washington with the Economic Defense Board. Prior to going to Washington, he was in the investment business in Boston.

Notice has been received from the First Naval District in Boston of the commission of Thoresby Potter Slack of Swansea, Mass., as a lieutenant in the United States Naval Reserve. Slack has been ordered to active duty as an aviation officer.

You will note below the new address of your Secretary. We hope that some classmates will make use of the new address and send in news. This is especially true of the men who have recently been called into the service. The above news was culled entirely from newspaper clippings. An occasional letter will help to liven up

1931 Continued

the reading matter and lend a personal touch to this column. — BENJAMIN W. STEVERMAN, *General Secretary*, 9 Graham Terrace, West Roxbury, Mass.

1932

In place of our big 10th reunion, we plan to hold a number of local dinners. We are attempting to obtain a group of leaders to serve as the nucleuses of the proposed informal dinner meetings. Each member of the Class will be notified of the details for the meeting nearest him. You can make a note of the date — Friday, June 5. If any of you wishes to volunteer your service as a leader, or if you have suggestions, please write to one of the Secretaries immediately.

Bill Kirkpatrick of the Allied Paper Mills, Kalamazoo, Mich., is now our assistant secretary. He takes over the job from Carroll Wilson, who finds that his duties as class agent take all the time that he is able to steal from his business. As a means of dividing the work, we shall start off on the basis that Bill will look out for you fellows who work west of an imaginary line drawn through Buffalo, Pittsburgh, and Birmingham.

Jim Harper, a captain in the Army, wrote us from Camp Livingston, La. Jim wound up his contracting business and has been concentrating on getting used to the many bosses and regulations of the Army. He sent us most of the information in this column about his fellow mates in the Course in Building Engineering and Construction.

Fred Alexander is now living at Mill and Moreden Road, Meadowbrook, Pa. Albert Dietz is assistant professor of building engineering and construction at the Institute. He lives in a new house at 19 Cambridge Street, Winchester. His small daughter, Gretchen Margaret, has a baby brother, Henry Avery, born last November. Donald Fetters of 3328 Wesley Avenue, Berwyn, Ill., is now vice-president of Gerhardt F. Meyne Company of Chicago. Stuart Fleming has been an engineer with Ford, Bacon and Davis, Inc., for six years. He lives at 7 Jones Place, West Orange, N.J.

Elmer Haynes is an engineer in the mining department of the Bethlehem Steel Company. He expected to return before this to Venezuela for construction work. For a year and a half he made highway location surveys in the Venezuelan jungles. — Albert O'Neill of 97 Grafton Street, Brockton, Mass., is a construction engineer with W. H. Ellis and Son Company, East Boston, doing work on the water front. Unless Stewart Phillips is in the Navy, he is still at 445 West Main Street, Clarksburg, W.Va., working as a cost engineer for the Hope Natural Gas Company. Morris Poze is an estimator and engineer for the M. M. Sundt Construction Company, Tucson, Ariz. Clarence Renshaw, a captain in the Army, is a constructing quartermaster at Fort Monroe, Va.

Richard M. Stewart of 7 Ardsley Terrace, Irvington, N.Y., is a patent attorney for the Anaconda Wire and Cable Company. Donald Whiston is an engineer with McCreery and Theriault. He worked on the new buildings at the Institute last summer. His address is R.F.D., 144 Washington Street, Whitman, Mass. Roger Zampell is a junior naval architect at the Philadelphia Navy Yard. John Zouck of Brooklandville, Md., is a metallurgical supervisor of rod and wire mill products for the Bethlehem Steel Company, Sparrows Point, Md.

From a Pennsylvania State College newspaper, *Mineral Industries*, we have word that Meir H. Degani has been appointed an instructor in geophysics at that college. He had been teaching science in a high school. — The *VI-A News* reports that Harold A. Traver is with the Office of Scientific Research and Development in Washington. G. A. Lowery is with the War Production Board in the same city.

Henry Chapin married Elizabeth Sanford of Farmington, Conn., on February 8 in the Congregational church of that city. Among the ushers were William Boyd, Albert Dietz, and Allan MacLeod. Mrs. Chapin attended Salem College in Winston-Salem, N.C. — Louis C. Raymond, who was recently with the Mountain Copper Company, Ltd., in California, is now a commodity specialist with the metals division of the United States Tariff Commission, Washington, D.C. — CLARENCE M. CHASE, JR., *General Secretary*, 1207 West 7th Street, Plainfield, N.J. WILLIAM A. KIRKPATRICK, *Assistant Secretary*, Allied Paper Mills, Kalamazoo, Mich.

1934

Herb Andrews responded to the request for a penny post card's worth of news and wrote in from Camp Haan, Calif. He has been in the Army over 18 months now and is a captain commanding the 68th Ordnance Company. Al Loring, also a captain, is commanding the 13th Ordnance Company. Herb spent his first year at Raritan Arsenal, N.J. The United States can feel safer with so many '34 men in the services.

Your Secretary has made a bad *faux pas*, but it may not be too late to rectify it. Back on May 26, 1941, the W. Franklin Baxters became the proud parents of a daughter, Jennifer Ann. Through an unforgivable oversight this important information was not published. May we still offer our congratulations, a bit belated, but nevertheless just as hearty.

Franklin Cross is engaged to Eunice M. Smith, daughter of Dr. and Mrs. F. W. Smith of York Village, Maine. Frank is now on active duty with the Chemical Warfare Service. — Norman Krim is also planning to march altarward. He is engaged to Beatrice Mildred Barron, daughter of Mr. and Mrs. Louis M. Barron of Cambridge, Mass. — Walt Wrigley, whose engagement was announced in an earlier issue, was married to Dorothy Brown, daughter of Mr. and Mrs. William W. Brown of Wollaston, Mass., last October. — F. William Wessel, Jr., was married on December 7 in Gardnerville, Nev. He and his bride are now at 520 Ralston Street in Reno, Nev., where he is an employee of the United States Bureau of Mines. We send our very best wishes to every one of you.

Well, fellers, there's not a great deal of news, but we can't print what we haven't got. How about saving a few pennies, buying some post cards, and scratching off a few lines? — JOHN G. CALLAN, JR., *General Secretary*, 184 Ames Street, Sharon, Mass. ROBERT C. BECKER, *Assistant Secretary*, Chile Copper Company, Chuquicamata, Chile, S.A.

1935

Once more it's a soldier who saves our column from oblivion. Johnny Mooring writes from an off-the-record address, which has doubtless changed by this time, anyway. To begin with, an item concerning John which appeared in the January notes requires correction. At that time we said that John had left the Army to pursue graduate work at the Institute. To stamp out this libel, we give you Johnny's own account of his wanderings: "I've been a shavetail in the Army since February 10, 1941, when my regiment, a New York National Guard outfit, was inducted into Federal service and sent to Camp Stewart, Ga. I got a leave of absence from Western Electric, which will be extended for my term of service. But goodness knows whether Western Electric will need engineers by that time.

"I spent 10 weeks at the Coast Artillery School at Fort Monroe, Va., between March and May, followed by the command of a hundred selectees during their basic training period. Then came the big break on July 15. I reported to the Cruft Laboratory, Harvard University, for a 2½-month course, and followed that by a three-month course at Tech. At present I'm back with the regiment on a special assignment. While in Cambridge, I took advantage of the sailing dinks and the Alumni Pool, and the powers that be were kind enough to let me park in the Graduate House. I spent a couple of grand week ends with the H. William Parker family in Woonsocket. Bill is now doing industrial engineering work with the American Roller Company there." Johnny also wrote that Otto Zwanzig had left the Public Service Electric and Gas Company in Orange, N.J., to take a job with the Cramp Shipbuilding Company in Philadelphia. Your Acting Secretary blushes to add that, although he was still at the Institute while John was pursuing his course there, we were both so busy that we didn't even get time for a single beer together.

At this time we can scarcely provide a complete list of classmates now in the armed forces, but from the address lists of the Alumni Office we learned that John Weber, George Garton, and John Hansborough are captains in the Army, and that Ben Blocker, Paul Gilmont, Mike Kelakos, Bill Lauder, and Gerry Rich are lieutenants.

The report of H. B. Kane '24 on the 1941–42 Alumni Fund as of February 15 showed our Class to be just about average. The goal was to get contributions from approximately one-third of all the Alumni, and we achieved 74 per cent of

1935 Continued

that figure, just 4 per cent below the average for all classes. Our individual contributors, however, were slightly more generous than the average. We turned in 58 per cent of our quota of dollars, as compared to 51 per cent for the average of all classes. This isn't a bad record, but neither is it worthy of a pat on the back. Several of our neighboring classes did a little better, and, still worse, we dropped about 8 per cent from our previous year's effort. Let's do better in the new 1942–43 Fund. Help us make a real contribution to Technology's great effort, which is so important to the country at this time.

Our one social note is the marriage of Loulee Henry to John Talbert in Bayonne, N.J., on February 7. The Talberts are living in Glen Rock, N.J. — WALTER H. STOCKMAYER, *Acting General Secretary*, Department of Chemistry, Columbia University, New York, N.Y. RICHARD LAWRENCE, *Assistant Secretary*, 111 Waban Hill Road, North, Chestnut Hill, Mass.

1937

This must be war! You fellows are conserving paper even down to stamps! — In the report of the Alumni Fund, I noticed with great satisfaction that our Class ranked among the highest, both in contributors and in amount of contributions. But our trend was down. Is that clear? You know what to do about it. What are we waiting for?

From the volume of the clippings I received, I'm sure that about 10 people in various parts of the country spend most of their time scanning newspapers for the number '37. Then if the clipping refers to M.I.T., a fire lights in their eyes and — snip, snip — we have another news item. The trouble with most of these items is that they are written briefly, as follows: Christian Febiger, IX-B, now an ensign in the United States Naval Reserve, is engaged to Josefa Richmond of Milton, Mass.; Edwin T. Herbig, Jr., VI-A, to Elaine Tenney of West Orange, N.J.; Godwin Gay, VI-A, to Joan Meacham of Garden City, Long Island, N.Y.; Earl D. Fraser, IV-B, to Elizabeth Argento of Newtonville, Mass.; and Eugene Perry Cooper, VIII, to Marjorie Cameron of San Francisco. Perry has received his doctor's degree and is now an assistant professor in the physics department of the University of North Carolina.

Gerard Smith, X, is engaged to Charlotte Keating of Baltimore, Md.; and H. Berkey Bishop, Jr., who is now a lieutenant in the Army, is engaged to Mary Ann Martin of Prescott, Ark. Berkey is stationed at the Southwest Proving Ground at Hope, Ark. — The marriage announcements all follow the basic formula: X plus Y equals Mr. and Mrs. X. — Harry S. Stern, Jr., XV, was married on March 1 to Judith Lachenbruch of Pleasantville, N.Y. Harry is now a lieutenant at Camp Lee, Va. Loring C. Farwell, IX, was married to Martha Jane Campbell on January 31, at Washington, D.C.

Outside of our cellar's being flooded and the coming dissolution of the War Department's reserve pool, there isn't much excitement around these parts, so we'll just sit back and enjoy the spring. — WINTHRIP A. JOHNS, *General Secretary*, Route 1, Bellemead, N.J. PHILIP H. PETERS, *Assistant Secretary*, 10 Babson Park Avenue, Wellesley Hills, Mass.

1938

Saturday, March 21, was a big day for '38 men. In Montpelier, Vt., Ed Hadley was married to Jean Kemp Leslie. At Skowhegan, Maine, Johnny Cook married Helen Cummings of Bennington College. Though we don't have the full details yet, we do know that Dick Young and Lloyd Bergeson went to Skowhegan for the big affair. John is in the Army Ordnance Corps and is living at 304 Prince Street, Alexandria, Va.

Just about that same time Ab Byfield, Fred Kolb, Al Wilson, Jim Laubach '39, Morrie Nicholson '39, Pat Hurley '40, Bill Folberth '41, and your Assistant Secretary were trying to light the stove in the Tech Cabin. Fred says he'll have the thesis for his doctor's degree completed by the time this column appears in print. Ab is with the Chemical Warfare Service at the Institute, and Al is with the A. O. Wilson Structural Company in Cambridge.

That same week end in March we heard news of a couple of silent Course II men. Frank Kearny blew into Boston for a three months' stay at Harvard, of all places. Punjab is taking the naval training program at the Harvard Business School. He says that Adam Gambel expects to be in the Navy soon, and that he saw Ira Lohman in New Orleans a few weeks ago. Ira is now stationed at Camp Wallace, Texas.

Frank Gardner is doing general metallurgical research with the American Brake Shoe and Foundry Company in Mahwah, N.J. Frank says that George Morel has joined the Technology gang there.

George Chase was married in January to Barbara French of Milwaukee. George came to Tech from the United States Naval Academy. He is now at Clewiston, Fla., teaching aeronautics. Eliot Ritchie was married in February to Grace Powel of Providence. Buddy is a lieutenant in the Navy. Stanley Ginsburg was married on January 15 to Elinore Weiss of Brookline. The Ginsburgs are living in Cambridge. Sol Kaufman was in the wedding party.

Charles Small is engaged to Marysia Chmielinska of Brookline; Arch Copeland to Joann Hausmann of Lake Erie College and Mentor, Ohio; Dave Hunter to Elizabeth Willcox of Newark, N.J.; Clark Robinson to Rachel Goldsmith of Wenham, Mass.; John Withers to Clara Grantham of East Orange, N.J.; and Walter Schwedes to Laura Ball of Syracuse University and Schenectady. Walt is with the General Electric Company.

John Glacken is with the Vega Airplane Company. He is living with Duane Wood '37 and Ken Comsey '39. From Elkton, Va., we hear that J. B. Toy is plant engineer of a Merck and Company, Inc., plant for the manufacture of Vitamin B_1. Harry Phinizy is at Victoria, Texas. Fuzzy is now teaching target identification in the Army Air Corps.

Fran Hagerty broke into the feature columns of the Boston *Traveler* recently. For three or four years Fran has been building racing shells in his yard in Cohasset. Among other things he has been experimenting with plywoods and is now developing this material for certain parts used in airplane construction. — DALE F. MORGAN, *General Secretary*, 142 Woodland Avenue, New Rochelle, N.Y. RICHARD MUTHER, *Assistant Secretary*, Room 1–180, M.I.T., Cambridge, Mass.

1940

It is with regret that we announce the first death of a classmate which has come to our attention since graduation. Bernard S. Edelman, IV-B, died on January 30. — Bill Schnorr has been sworn in as an ensign in the United States Naval Reserve. His general duties will be those of an ordnance officer. Bill was commissioned on February 7. Until then he had been an apprentice with the S. D. Warren Company. — Bob Davis is a lieutenant with the Chemical Warfare Service in New York City.

E. S. West and Nancy McWilliams were married on February 5. Virginia F. Kenniston was married to Ralph N. Thompson on January 31. Dick Lawrance and Frances Morse Tewksbury, Simmons '40, have announced their engagement. — The call which I sent out last month for information about the whereabouts of Dan Crosby had results, for I have learned that he has become engaged to Ethelwynne Dorothy Bridge.

Come on, gang, you'll have to send in more letters if you expect any kind of a news column. — H. GARRETT WRIGHT, *General Secretary*, 44 Main Street, Hilton Village, Va. THOMAS F. CREAMER, *Assistant Secretary*, Room 3–208, M.I.T., Cambridge, Mass.

1941

Ye press tells us that Cora May Farrier is engaged to Howard W. Wade, an ensign in the Naval Reserve, formerly of Middlebury College; that Margery Ann Woodall is engaged to Walter D. Willey, also an ensign, formerly of Hampden-Sydney College; that Barbara Jeanne Vandersloot became the bride of Joseph M. Bird, a lieutenant in the Army Air Corps, formerly of Dartmouth College; and that Virginia Rae Matchett became the bride of Frederick Spenceley, a graduate of St. Lawrence University. Fred is now employed as an engineer in the aerodynamic design department of the Bell Aircraft Corporation of Buffalo. We also read that Dorothy Ann Sturm became engaged to William Kussmaul, who is now a lieutenant.

We hear that Anne E. Waring is engaged to Robert T. Luedeman; that Margery B. Moul is engaged to Alvin H. Hartman, now an ensign, formerly of Illinois Wesleyan University; that Ventura Ruggieri is engaged to Mario W. Conti of basketball fame, and now a lieutenant; that Mary Elizabeth Mc-

1941 Continued

Cormack is engaged to Richard H. Sugatt, now an engineer with the Western Electric Company in Kearny, N.J.; that Mariedora Thompson was to wed Parkman Blake Moore, a lieutenant in the Navy, on February 21; that Mora Jane Somers is engaged to Edward B. Winslow, now an ensign at the United States Coast Guard Academy; and that Margaret Jourdain Adams is engaged to Eugene A. March.

Marjorie Mae Strauss is engaged to Mitchell Joseph Marcus, now a lieutenant at Wright Field, Dayton, Ohio. — (We take it out on the fellows who do not write in by spelling out their middle names every time we get the chance. We're just waiting for an item to come up about a certain Course II man.) — Irwin Goldberg has resigned from his job with the Pratt and Whitney Company of Canada to take a commission as a pilot officer in the aeronautical engineering division of the Royal Canadian Air Force. Irving Berman is a lieutenant with the 809th Engineer Battalion, Westover Field, Mass. Isaac Harry Mandil, an ensign, E-V(S) — don't ask us what it means — has just received a commission in Uncle Sam's Navy. Mandil is a graduate of the University of London. Arnold S. Mengel has reported for naval aviation flight training at Floyd Bennett Field, Brooklyn, N.Y.

Hazel Winifred Thropp married Kenneth Roe, formerly of Columbia University. Kenneth is now an ensign at the Philadelphia Navy Yard. Jane Browning Herrick was married to Hamilton Johnson. Semah Michelson is engaged to Herbert Daniel Klein, now a lieutenant at Fort DuPont, Del. — You notice we hesitate to put dates on our choice items. The reason is obvious — we simply haven't got out of our Course XV habit of getting reports in late.

Wed in Canada were Emily Aldrich and John Austin Hornbeck of Oberlin College and M.I.T. Bettina Daniels is engaged to Joseph A. Neuendorffer. Margaret Jeanne Gunther became Mrs. Miles Ross. Miles is now with the North Carolina Shipbuilding Company.

So there you have them — your latest press items right out of the newsprint and not more than a year old. Now that the rush to enter the services is over, thoughts of normal living have come back and the imposing list above is the result. We certainly wish we could give everybody involved a royal fanfare and a separate page describing the bride's wedding gown of ivory satin, with long bodice and heirloom lace at the sweetheart neckline, and so on. But, doggone it, you've all gone and done it at the same time and there simply isn't room. In any event, best wishes to all.

Roundabout sources say that Fred Came is at the Procter and Gamble Distribution Company in Memphis, while Norman Thomas is at the Springfield Arsenal. A long-lost letter tells us that Ed Marden is busy as a lieutenant in Newfoundland and is keeping the situation under control. — Les Corsa indicates that track interest is still being maintained. Paul Des Jardins '38, Dan Crosby '40, Ed Lemanski '40, George Clark, Les, Gene Brady '42, Ed Czar '43, Sid Hall '43, Bob Meny '44, Oscar Hedlund, and Doc Johnson met at the Hotel Lincoln for good bull sessions before and after the Millrose meet in New York City. Recognize the names of all those track immortals? Sorry we missed the meeting.

Les was to meet Lew Jester and Elizabeth Sweeney at the IC-4A indoor meet on March 7. We've been good long enough, Corsa, so we hereby announce the engagement of the above-mentioned young people. Les is now a research assistant at Lederle Laboratories, Inc.

Two social affairs are quite worthy of mention in a separate paragraph. Nancy Linda Boyle has become the bride of your Secretary's ex-roommate Lyle Merton Richardson. Mert and Lin dropped in on us on the way down to Camp Lee, Va., where Mert is a lieutenant. We had a grand time discussing old times at the quartermaster school. — Wonder where Millerbee has disappeared. — The most recent item is one which happened on March 14. Prexy Will Mott took as his bride Charlotte Douglass of the famous M.I.T. Douglasses. Our most hearty congratulations to all!

The Army can't get along without Walt Keith. In fact, they like him so much that they're going to snatch him out of the Graduate School of one of the leading technical institutions of the country. Walt reports to Aberdeen Proving Ground on April 1. His thesis partner, Larry Turnock, is soon to follow. Meanwhile, the better half of this correspondence partnership, Stan Backer, is still in Philly, the victim of army uncertainty.

It would be unprecedented for this column to close without a plea for more letters, so don't forget that if you believe in the saying "No news is good news," this column will never get written. — STANLEY BACKER, *General Secretary*, 46 Bicknell Street, Dorchester, Mass. WILLIAM R. AHRENDT, *Assistant Secretary*, The Graduate House, M.I.T., Cambridge, Mass.

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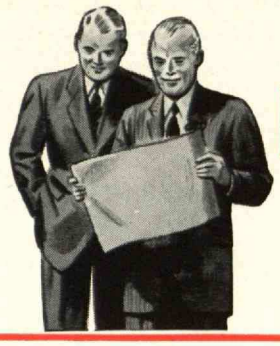

For industry, this is a war of conservation of production equipment—especially of equipment that is becoming difficult to replace—like mechanical rubber goods.

These include such widely different necessities as power transmission belts—both of the flat and V types; conveyor belts to transport the materials of industry and construction; hose for water, steam, air, oil, gasoline. There are thousands of other items of rubber equipment or parts important for Victory.

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IMPORTANT SUGGESTIONS

BELTS

Keep pulleys clean, in good condition and in correct alignment so that belts will run true and wear evenly.

A belt that is too tight may cause fastener and bearing trouble. If too loose, may slip and wear.

Use belt dressing on flat belts only when essential and then as recommended by rubber manufacturers.

Too high temperature will shorten belt life.

Oil deteriorates rubber belts.

Tight side down gives greater arc of contact, delivers more power.

Use right size and type belt, install correctly and use proper type and size fasteners.

Too small pulleys may shorten life of belt.

Rubber belts should be stored in a cool, dark place.

Write factory or ask distributor to send a MANHATTAN service man.

CONVEYOR BELTS

Make sure idlers turn freely and are lubricated properly so oil or grease will not injure belts.

Avoid long drops for heavy materials.

Load evenly and centrally. Irregular, uneven or heavy loading causes spillage, also tends to make belt run crooked and wear unevenly. Hard or jagged pieces passing between pulleys and belt will damage the belt.

Don't overload or overspeed conveyor.

Use end pulleys of ample size.

A MANHATTAN field engineer or service man will be glad to examine your installation. Write factory or distributor.

HOSE

Avoid sharp bends at fittings; also twists and kinks in body of hose.

Attach couplings carefully, forcing shank straight into hose, using soap and water lubricant.

When not in use, roll up or suspend hose.

Do not let hose lie in sun, hot or damp places.

Do not permit heavy objects to run over hose.

Avoid excessive temperatures, violent fluctuations of pressure.

Straighten hose before dragging and while unpacking. Do not forcefully bend, twist, kink or pull hose.

Use the correct type and size hose for the conditions.

Store in dark, cool place.

Consult MANHATTAN service man.

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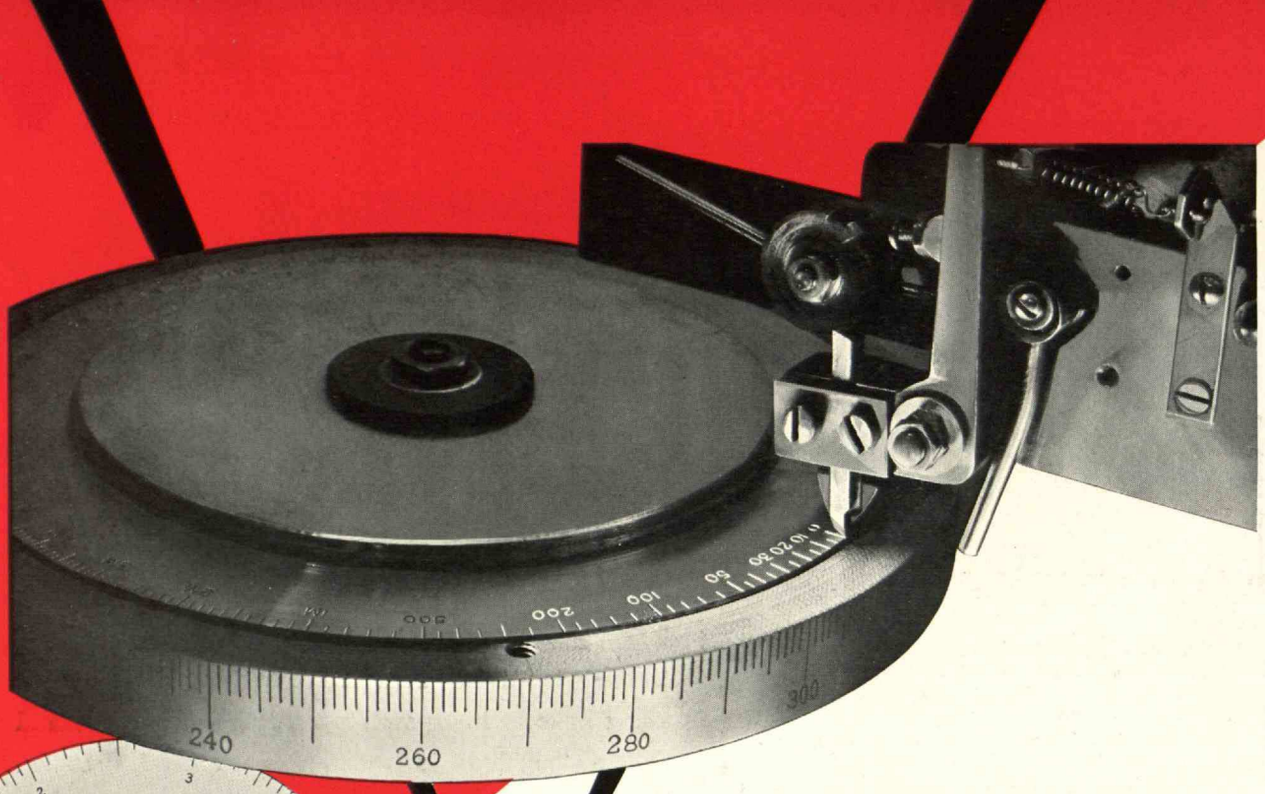


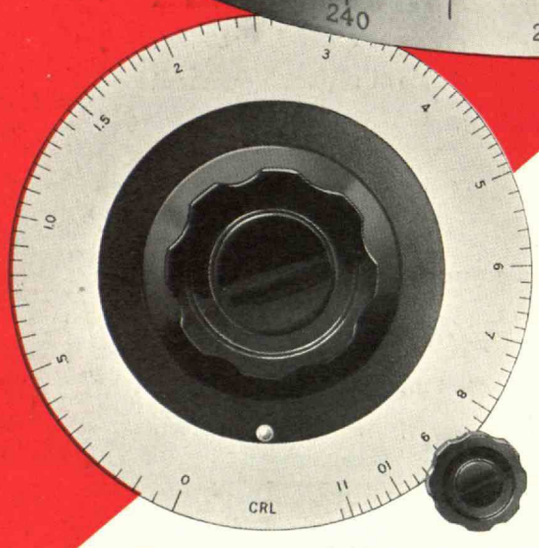
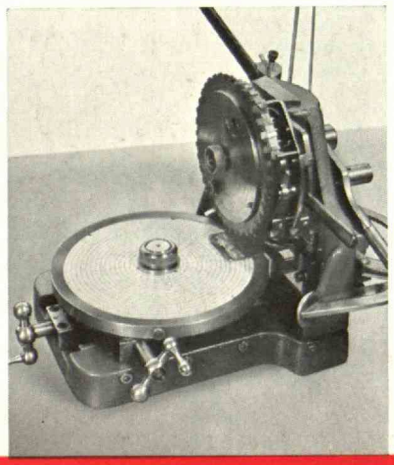


Photo-etched dials (above) *are used on some instruments where great accuracy is not required or when variations in scale uniformity can be compensated for by means of mechanical cams on the variable elements of the circuit.*

(Below) *This printing machine has been developed by G-R to print scale calibrations on a six-inch dial which is hand-marked at over 1,500 points on a scale whose effective length is fifteen feet.*



ACCURATE CALIBRATION

VERY accurate calibrations are furnished with many General Radio instruments. No matter how good the internal stability of any instrument, its usable accuracy depends upon the reliability with which the variable-control element may be reset after calibration. An incorrectly engraved dial or a dial with irregularities in its scale will immediately nullify the stability of the best electrical circuit.

Many General Radio instruments are equipped with dials, such as the logarithmic type, on which the scale divisions are not uniformly spaced. Most instruments of this type are individually calibrated in the laboratory, the setting for each calibration point being indicated on the dial by a fine pencil mark. The dials are then transferred to a hand-operated engraving machine (illustrated) where the divisions are carefully engraved over the pencil lines; they are then sent to the laboratory for replacement on the instruments, and for final checking.

Other instruments require linear scales engraved with great accuracy. Dials with photo-etched scales do not have the necessary accuracy, hence these scales are engraved on an automatic self-indexing engine divider on which a geared motor accurately rotates the dial through the required arc, the dial pausing in its rotation long enough for a steel to engrave the divisions.

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